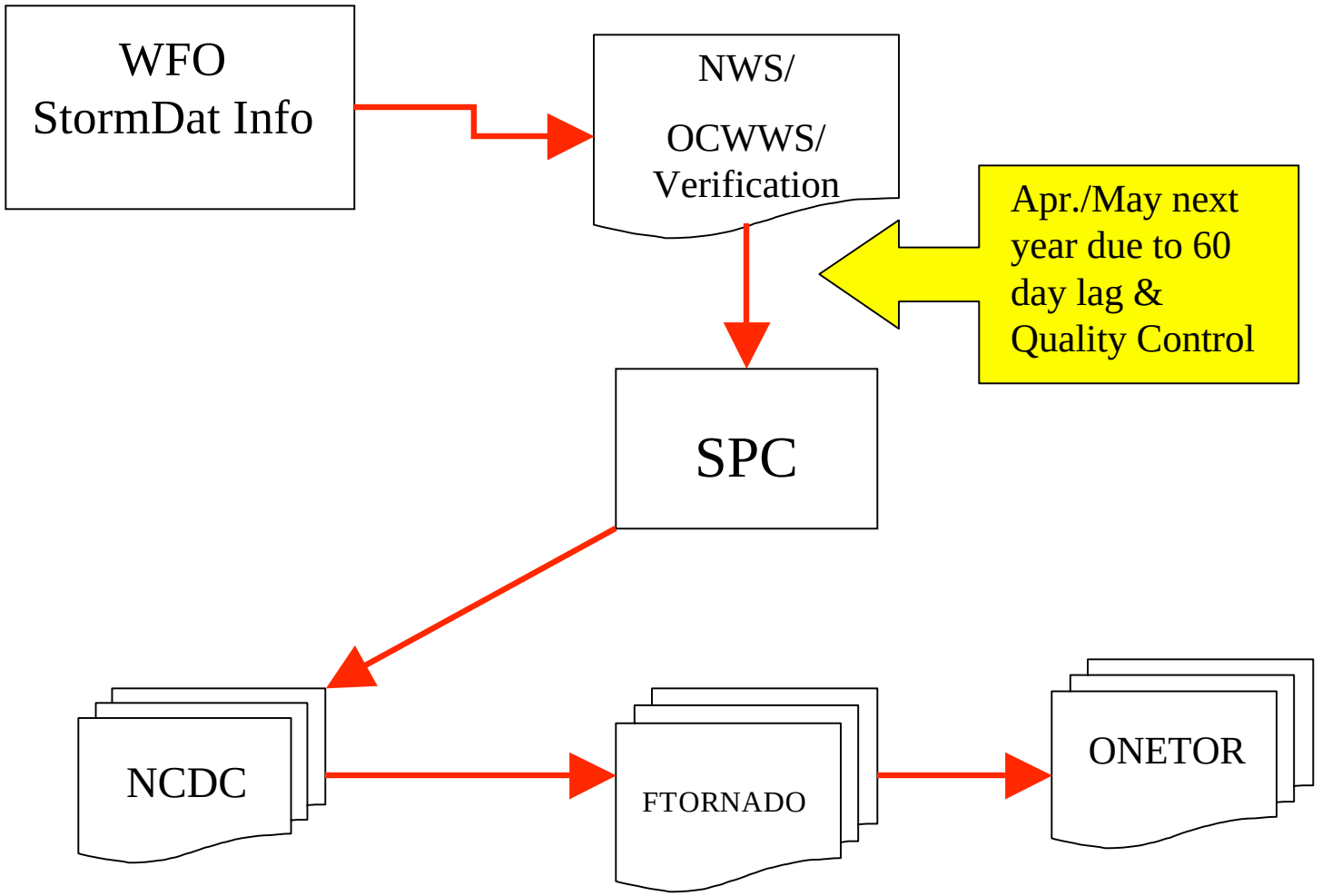
NCEP

The SPC Severe Thunderstorm Database

WHERE AMERICA'S CLIMATE AND WEATHER SERVICES BEGIN

SPC Database Derivation



SPC Severe Thunderstorm DATABASE

A Severe Thunderstorm is a thunderstorm that produces a tornado, winds of at least 50 knots (58mph), and or hail at least 0.75 inch in diameter. Structural wind damage may imply the occurrence of a severe thunderstorm.

Tornadoes since January 1, 1950

Wind and Hail since January 1, 1955

SPC Data Source

Since 1972… data agrees with NOAA *Storm Data*.

Prior to 1972…

- tornado data -- from *Storm Data* (or its predecessor *Climatological Data National Summary - Storm Data and Unusual Phenomena*)
- wind and hail data --from real time information collected by the U.S. Air force.

Errors corrected when identified (if possible)

1972 Wind & Hail data incomplete

Uniqueness of SPC Tornado Database

- SPC Tornado Database is EVENT based

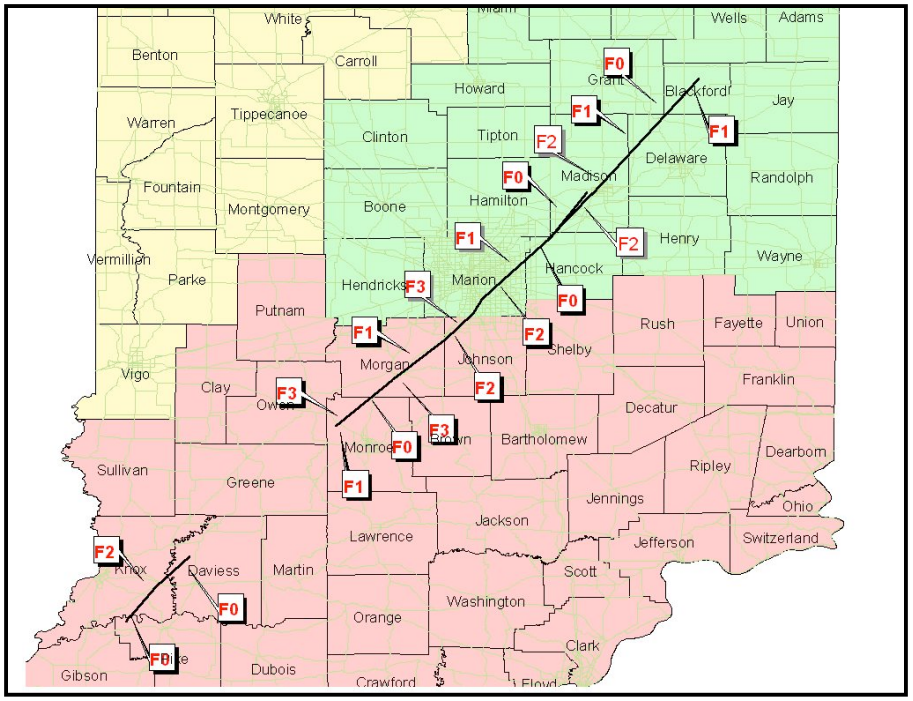
- NCDC (Ashville) Database is SEAGMENT based

For 1950 - 2001:

SPC had 43,467 tornadoes

NCDC had 46,472 tornado segments

What is a tornado Segment?



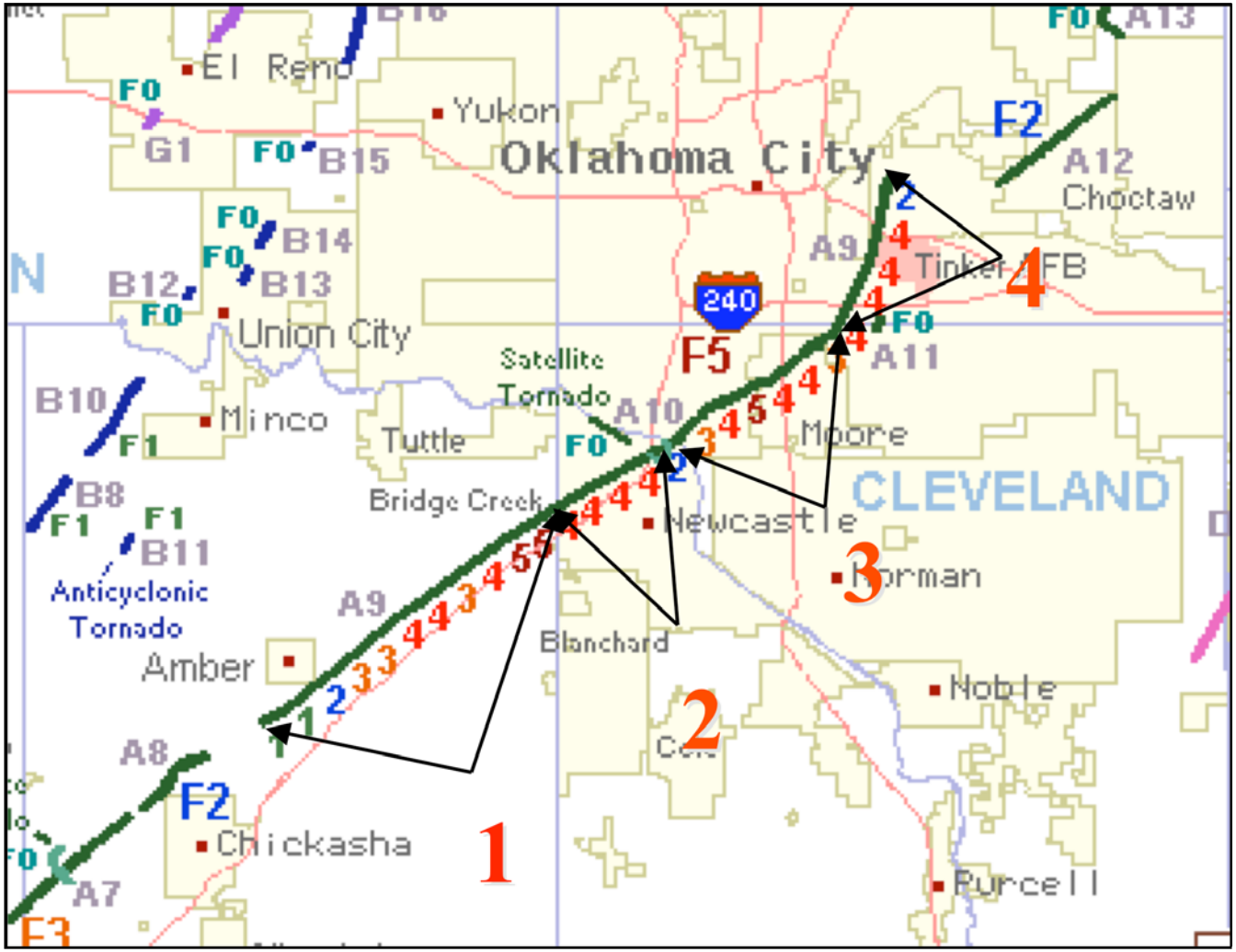
Sep 20, 2002 Indiana Tornadoes

Tornado #1 = 3 segments

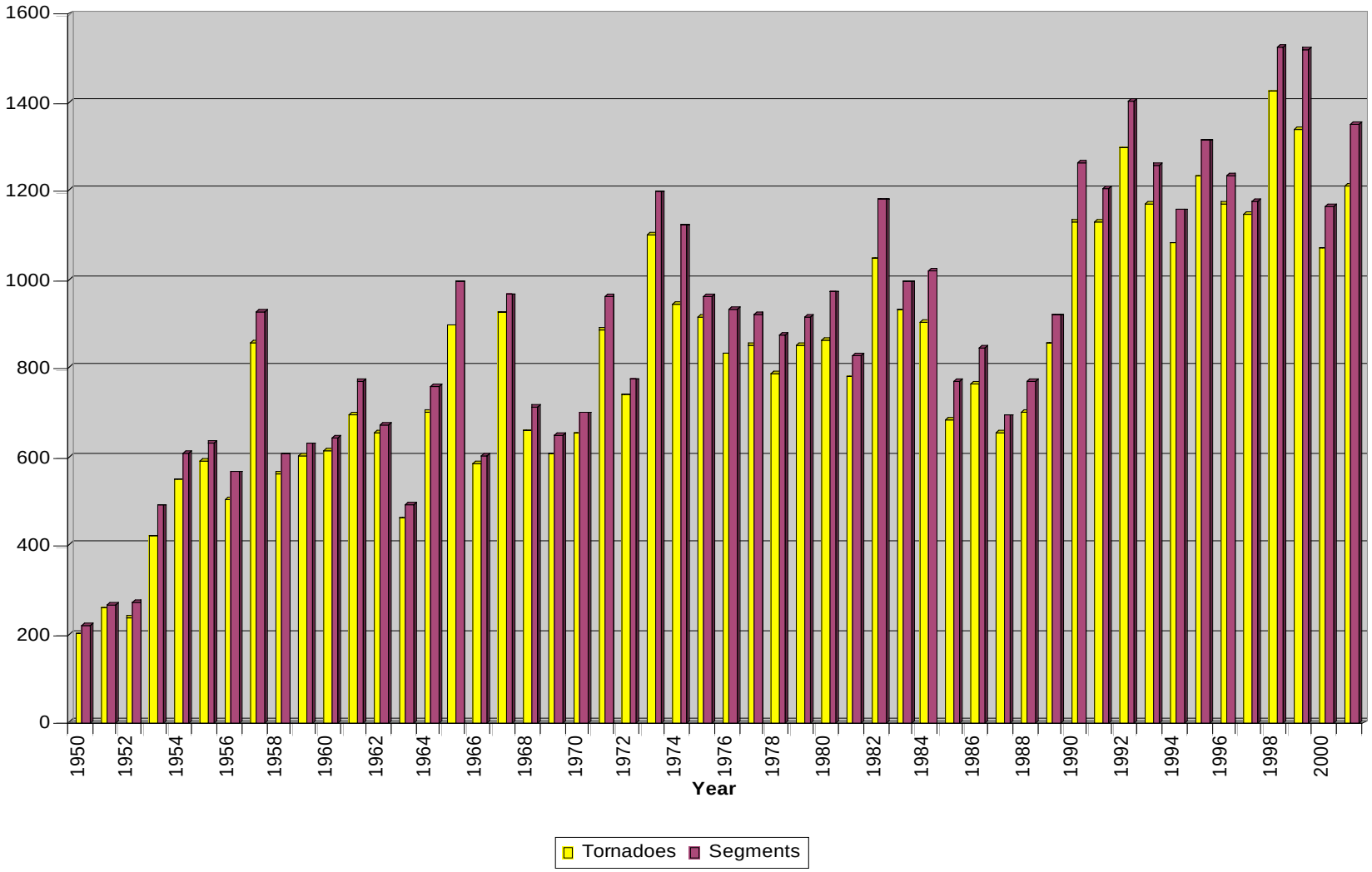
Tornado #2 = 9 segments

- Pre-1996
  - Enter/left a county with fatality/injury
  - Crossed a State boundary
- Since 1996
  - Tornado segments are divided by counties and States
  - When tornado makes "sharp turns" within a county in order to adequately describe the path

Example of Tornado Segments



Tornadoes v. Tornado Segments 1950-2001



SPC Database Fields

- Year
- Number (by State)
- State
- Month
- Day
- Date
- Time (CST)
- Tornado Number
- No-States
- State-Tornado number
- Segno (1=entire tornado, 2 = state portion)
- STLAT/STLON
- SPLAT/SPLON
- Length
- Area
- F*Area
- Width (Max)
- Fatal
- Injuries
- Damage
- CO (1-4)
- F
- P_L
- P_W

SPC
Severe Thunderstorm Wind & Hail Report Database

68,612 Hail reports back through 1955

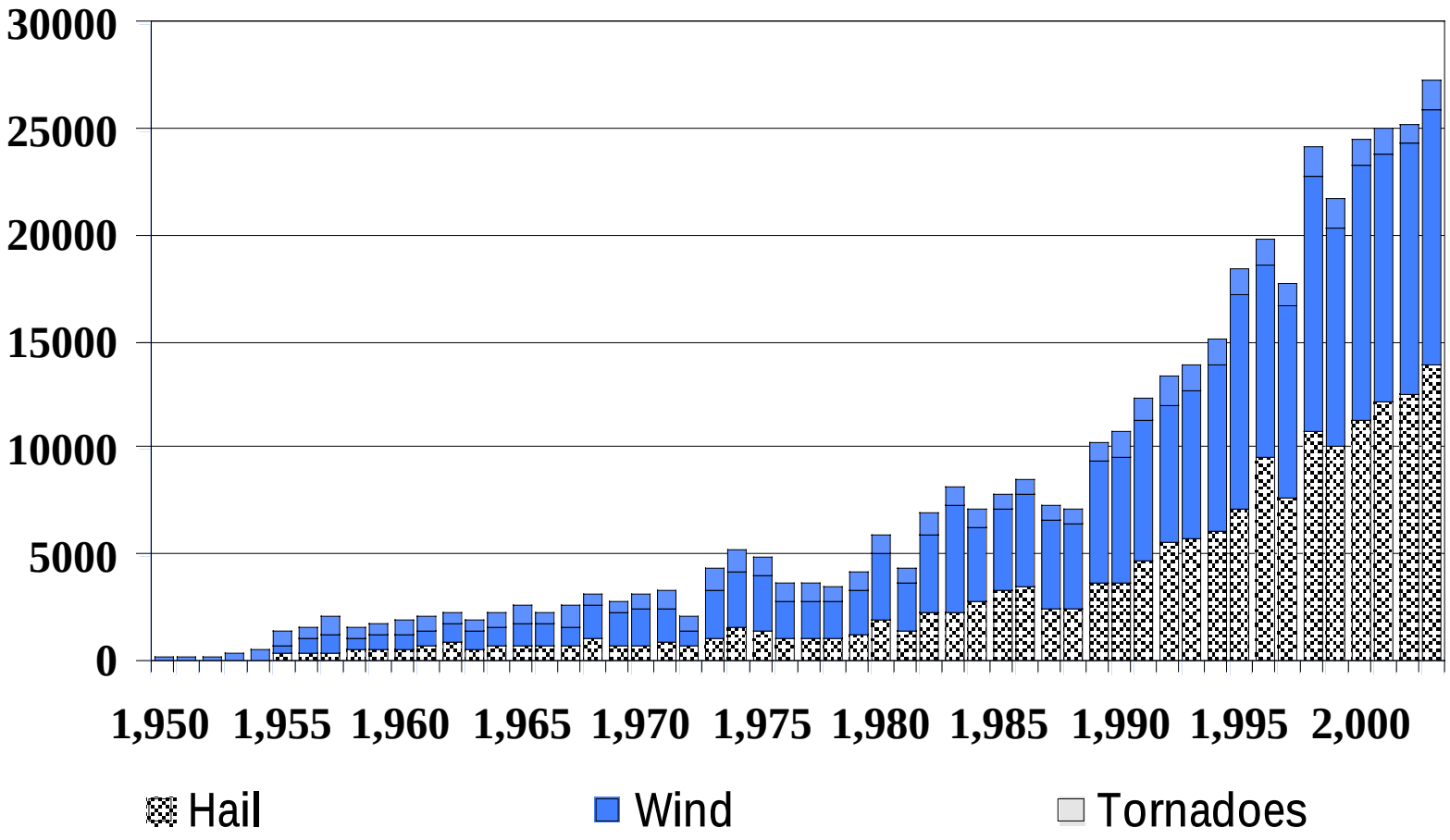
- Reports within one county must be separated by 10 miles or 15 minutes if less than 65 kts and did not cause deaths or injuries or did less than $500K damage

203,698 Wind back through 1955

- Reports within one county must be separated by 10 miles or 15 minutes if smaller than 2” and did not cause deaths or injuries or did less than $500K damage

Format similar to Tornado Database, except F is relplaced by diameter (hundredths of inches) or wind speed (knots). Other tornado related fields are left blank.

Severe Thunderstorm Reports

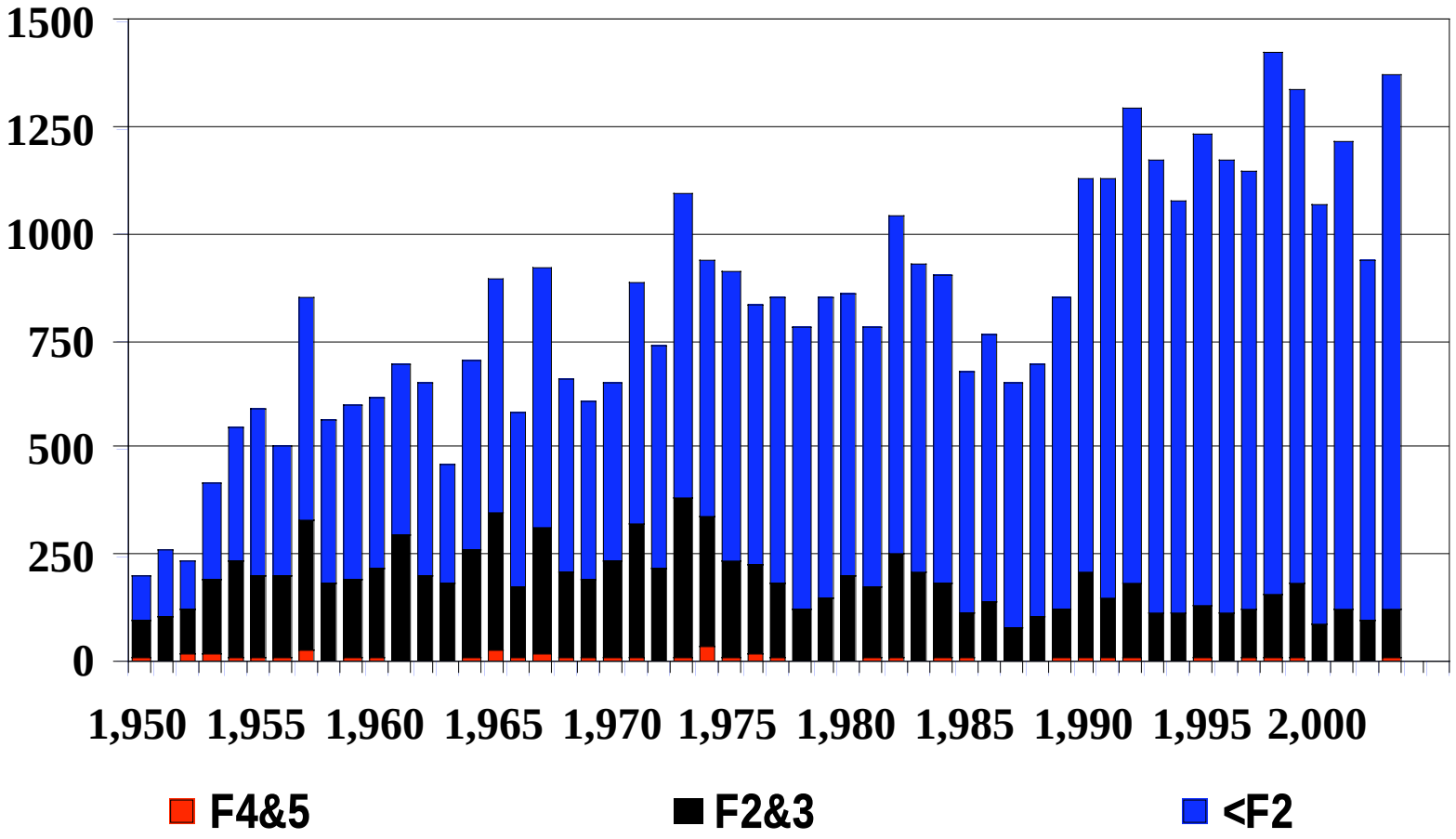


F-Scale Evaluation

"The tornado first touched down on the eastern edge of General Smallwood State Park just north of Rison. It pushed east-southeast and passed just south of Pisgah where it grew to F2 strength. The tornado moved through Mount Pisgah and damaged homes on Ripley Road between Ripley and Garden Estates. The twister continued to move east through rural lands south of Hawthorne Road (Route 255) passing just north of the community of Graystone. Next, it moved through the communities of Habre de Venture, Longmeade, Clamber Hill, Hawthorne Manor, and Hillendale about 3 miles west of downtown La Plata. The tornado, now F3 strength, hit the western portion of La Plata next, moving directly through the neighborhoods of Valley View, Morgan's Ridge, Quailwood, and Haldane. The tornado, now F4 strength, continued east into the downtown area where it crossed through the intersection of Route 301 and 6. Damage was found on either side of Route 6 with the most severe devastation occurring on the south side of the highway."

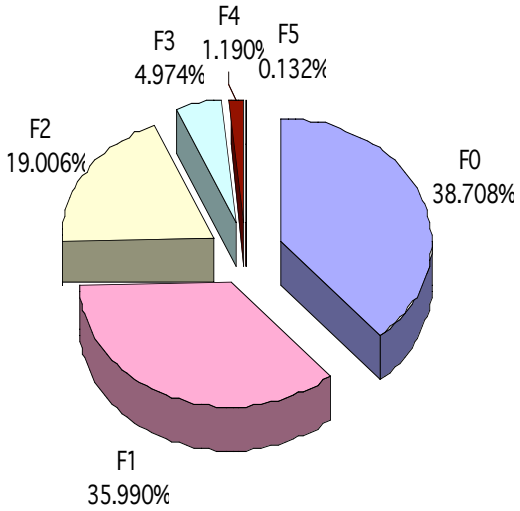
F-Scale is misinterpreted in describing tornado strength. This tornado is causing more damage rather than gaining strength! Little description of the tornado itself! How is it known the winds became stronger?

United States Tornadoes

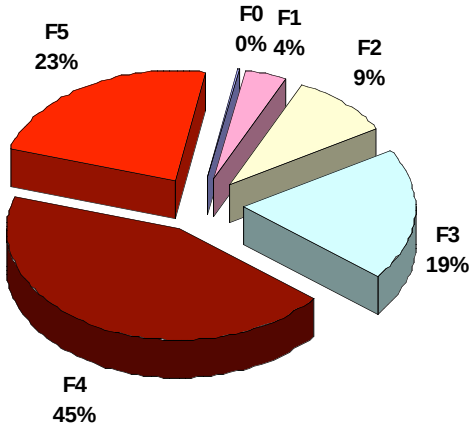


F-Scale Percentages

1950 - 2001

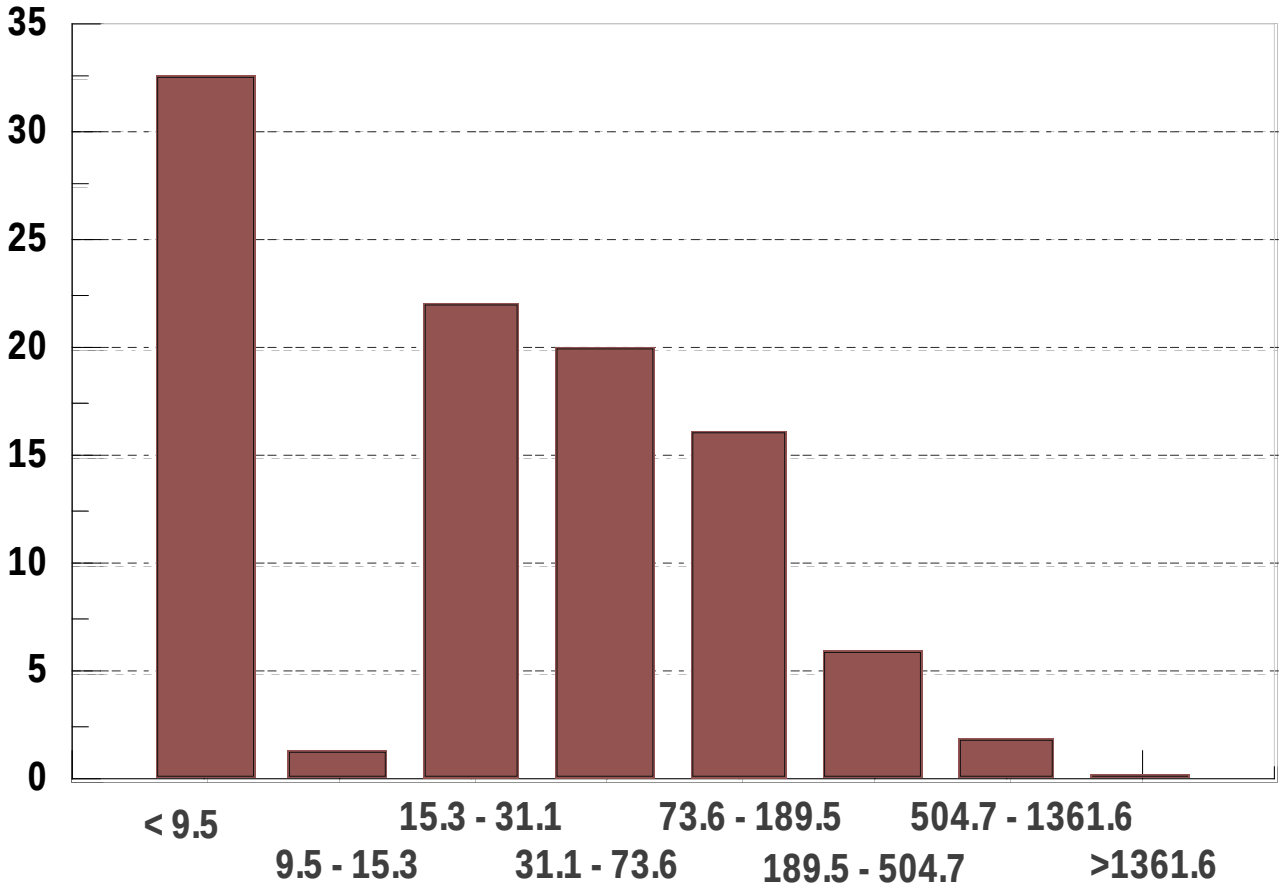


Number

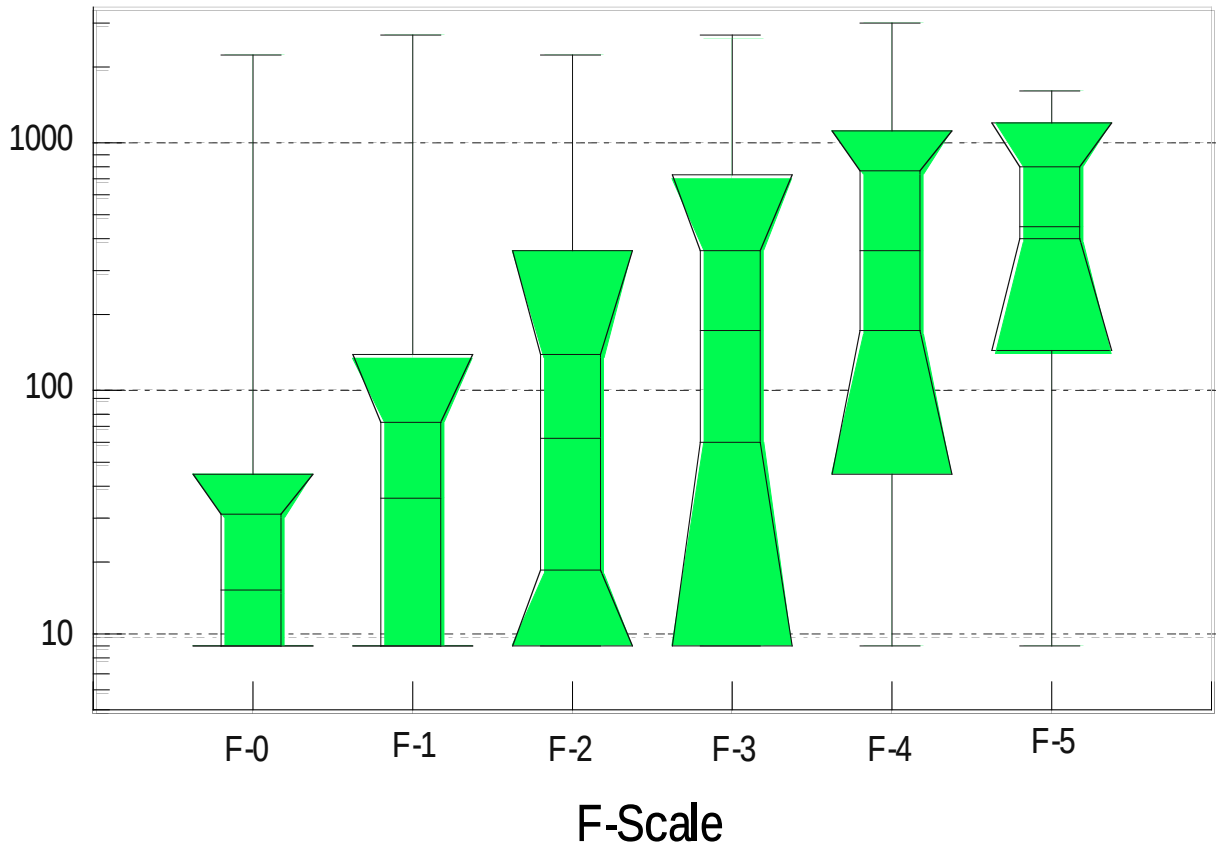


Deaths

Width Distribution (1950-200



Width as a Function of F-Scal



Which is the F5 Tornado?

F5

Oklahoma City, OK

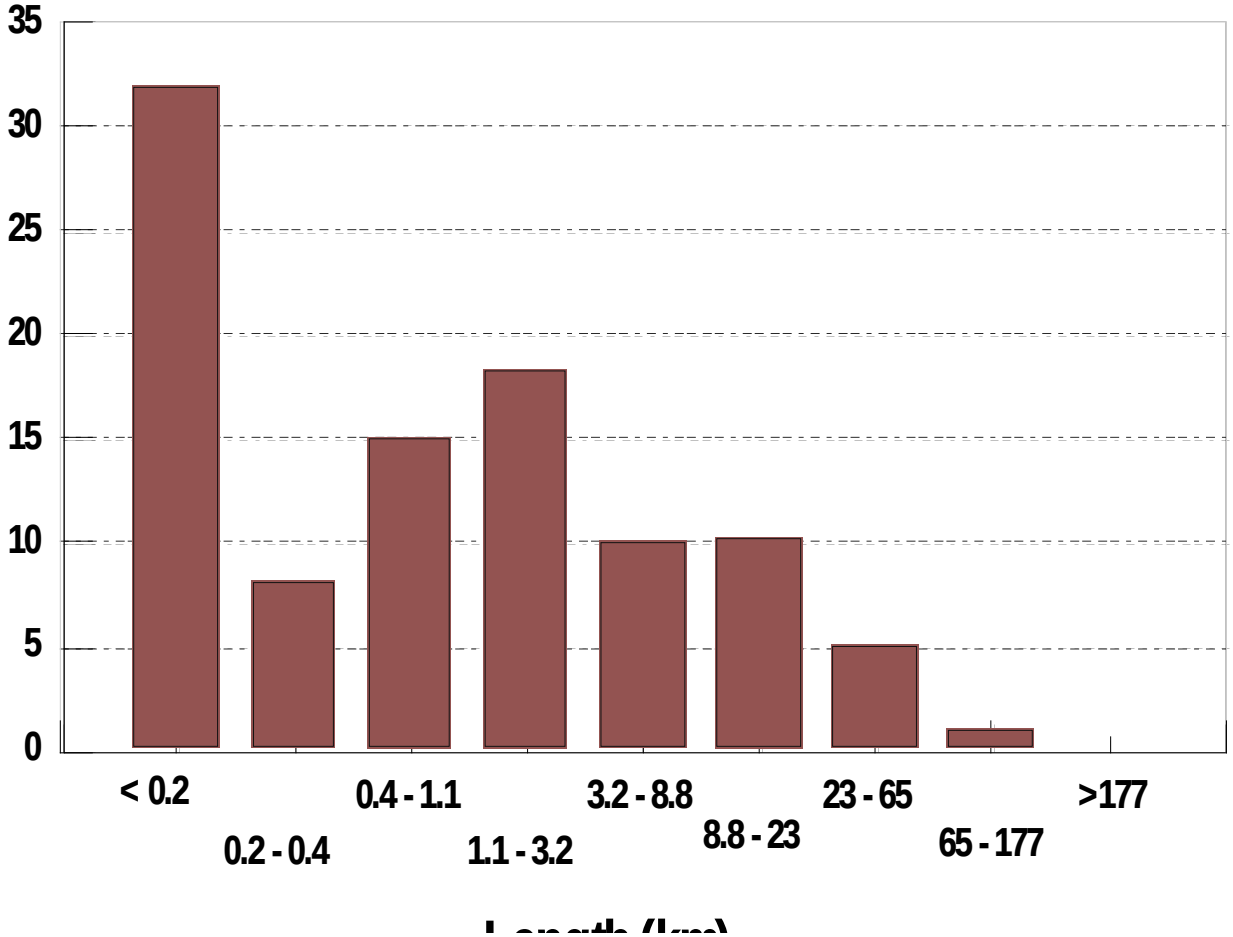
May 3, 1999

F2

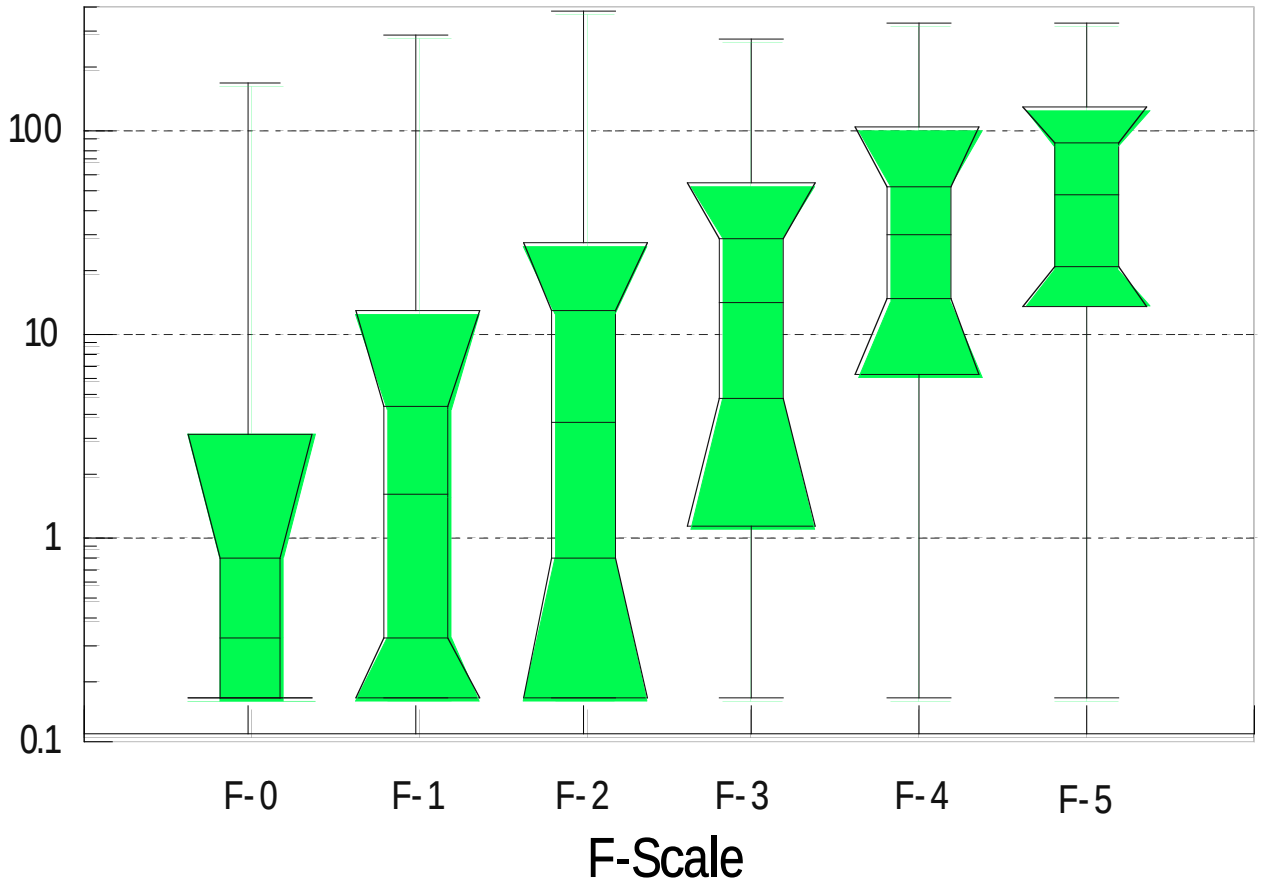
Burkburnett County, TX

March 7, 2002

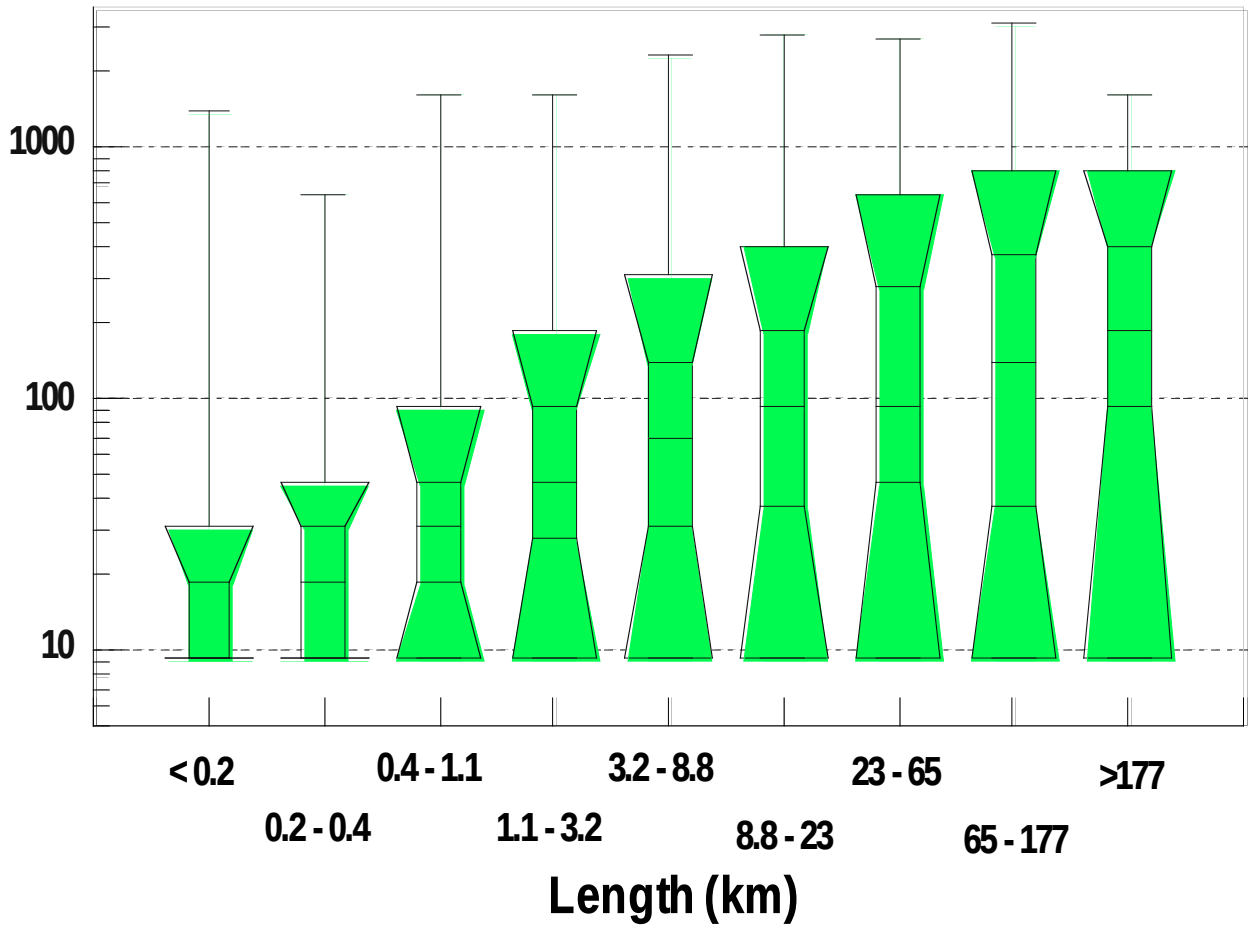
Length Distribution (1950-200



Path Length as a function of F-Sc



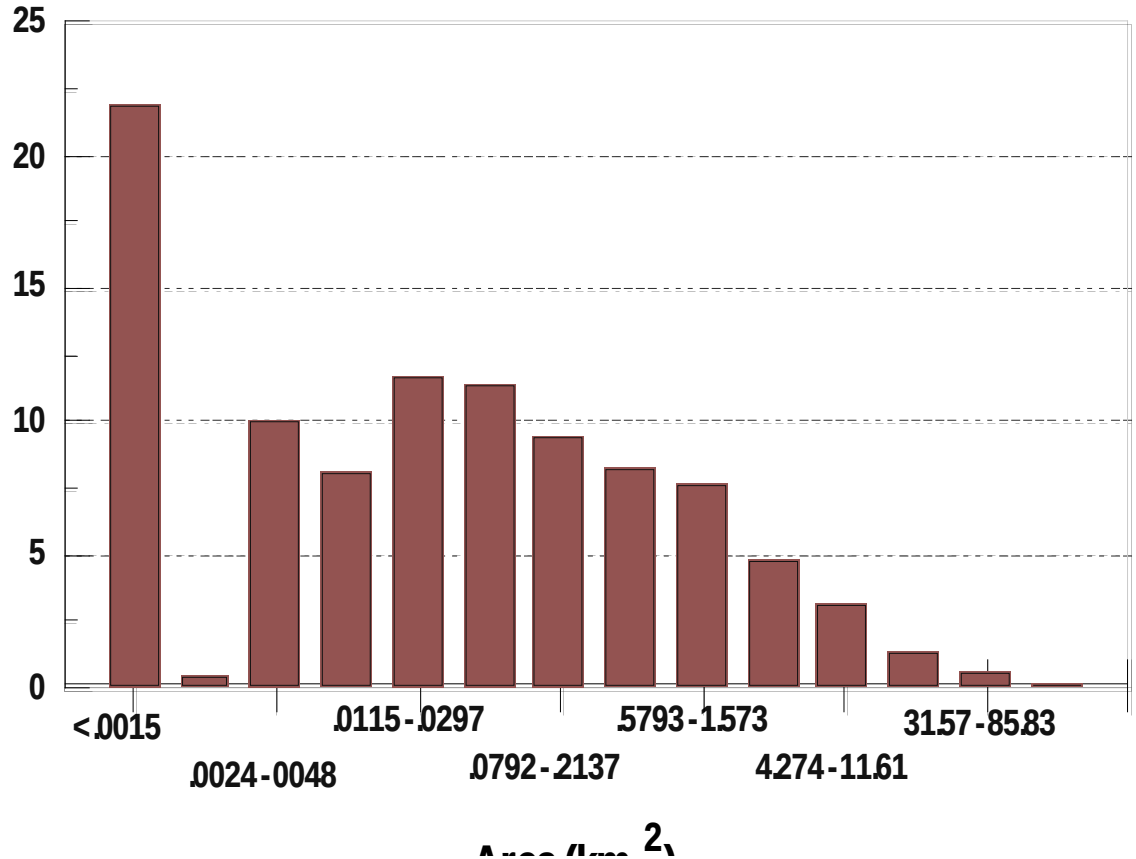
Width as a Function of Lengtl



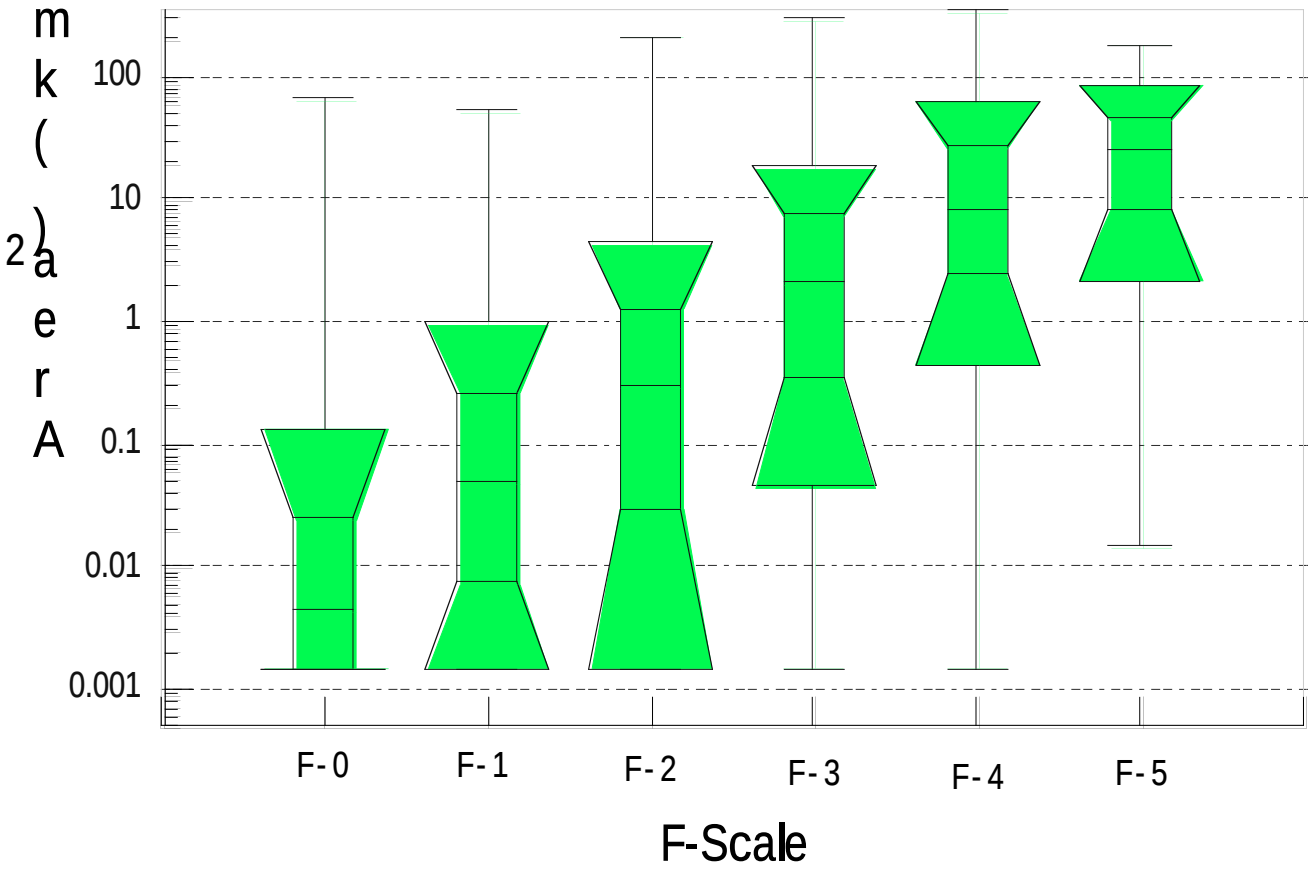
Manhatten, KS
May 31, 1948
F-2
Length – 20 km
Width – 130 m

Seymour, TX
April 10, 1979
F-2
Length – 17 km
Width – 300 m

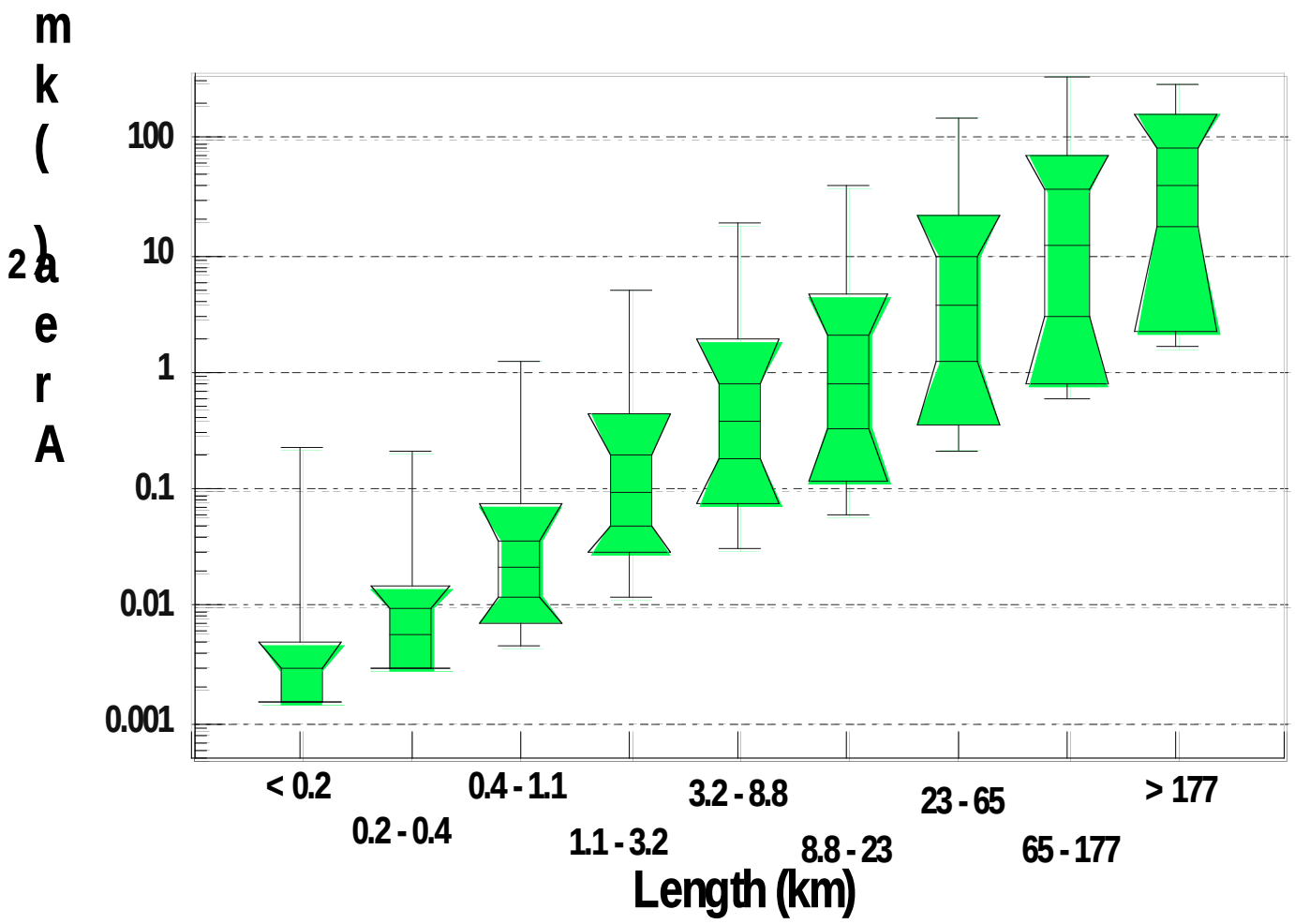
Area Distribution (1950-2000



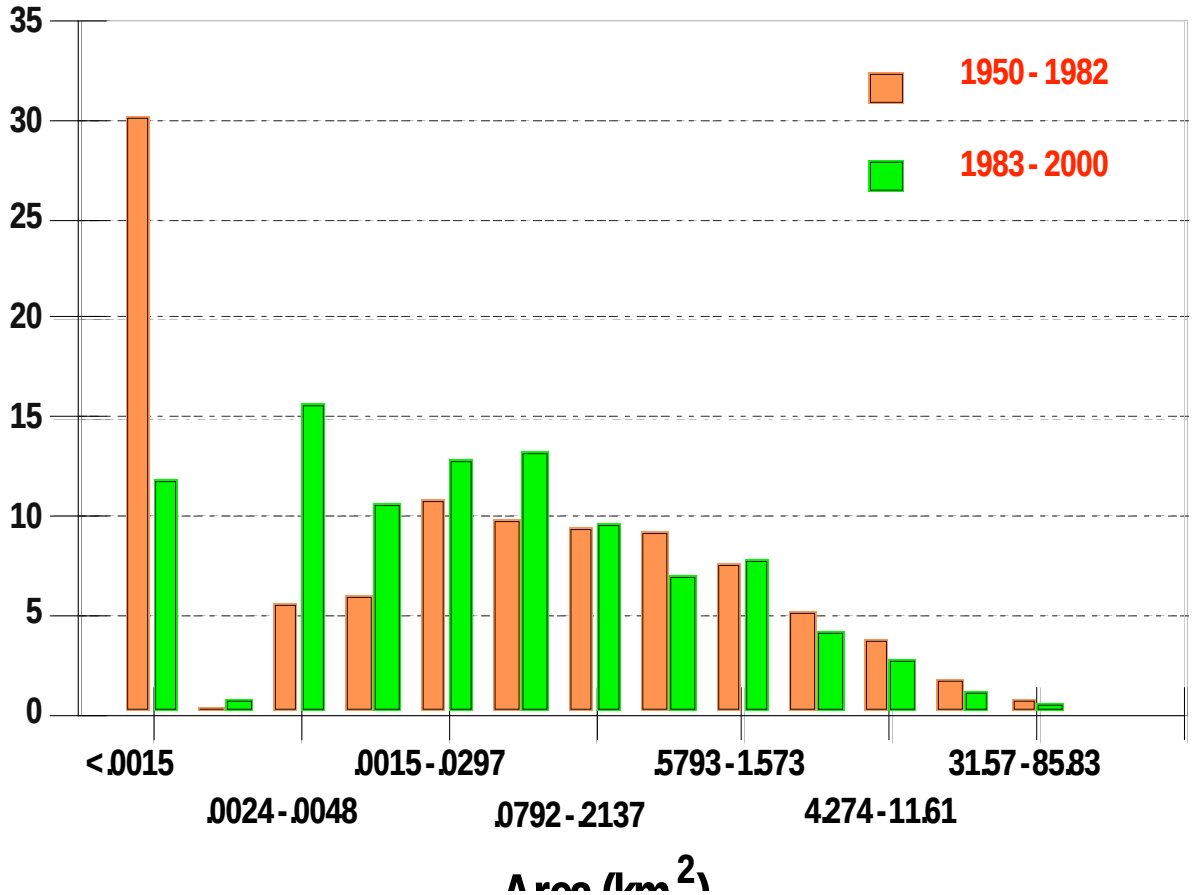
Area as a Function of F-Scale



Area as a Function of Length



Area Distribution with Time



Minimum Assumption Tornado Hazard M

- Empirical Method -

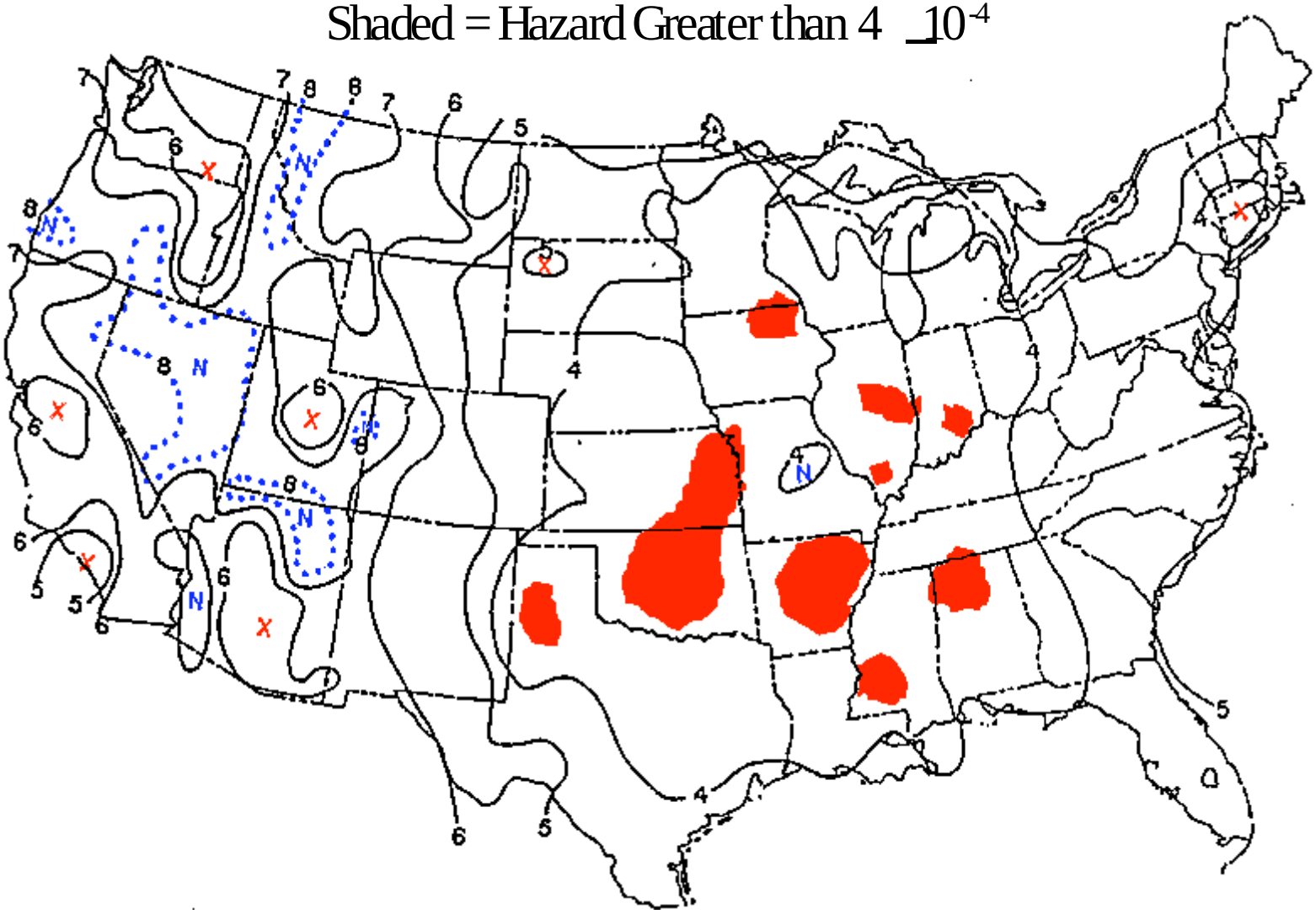
- **Semi-homogeneous Local Area**
  - Identify Tornadoes in 2 ° Marsden Squares
  - Overlap Squares Every Degree
- Compute Total Tornado Area
  - Explicit Product of Length and Width for Each Tornado
  - Sum for All Tornadoes
- Compute Percent of Area Affected by Tornadoes
  - % Affected = (Summed Tornado Area)/(Area of Square)
- Normalize by Year
  - Hazard = (% Affected)/(Years of Data)/(Number of Years)

Grand Gulf, MS
April 17, 1978
F-3

HAZARD FROM ALL TORNADOES

Contours Negative Powers of 10; X = maxima; N = minima

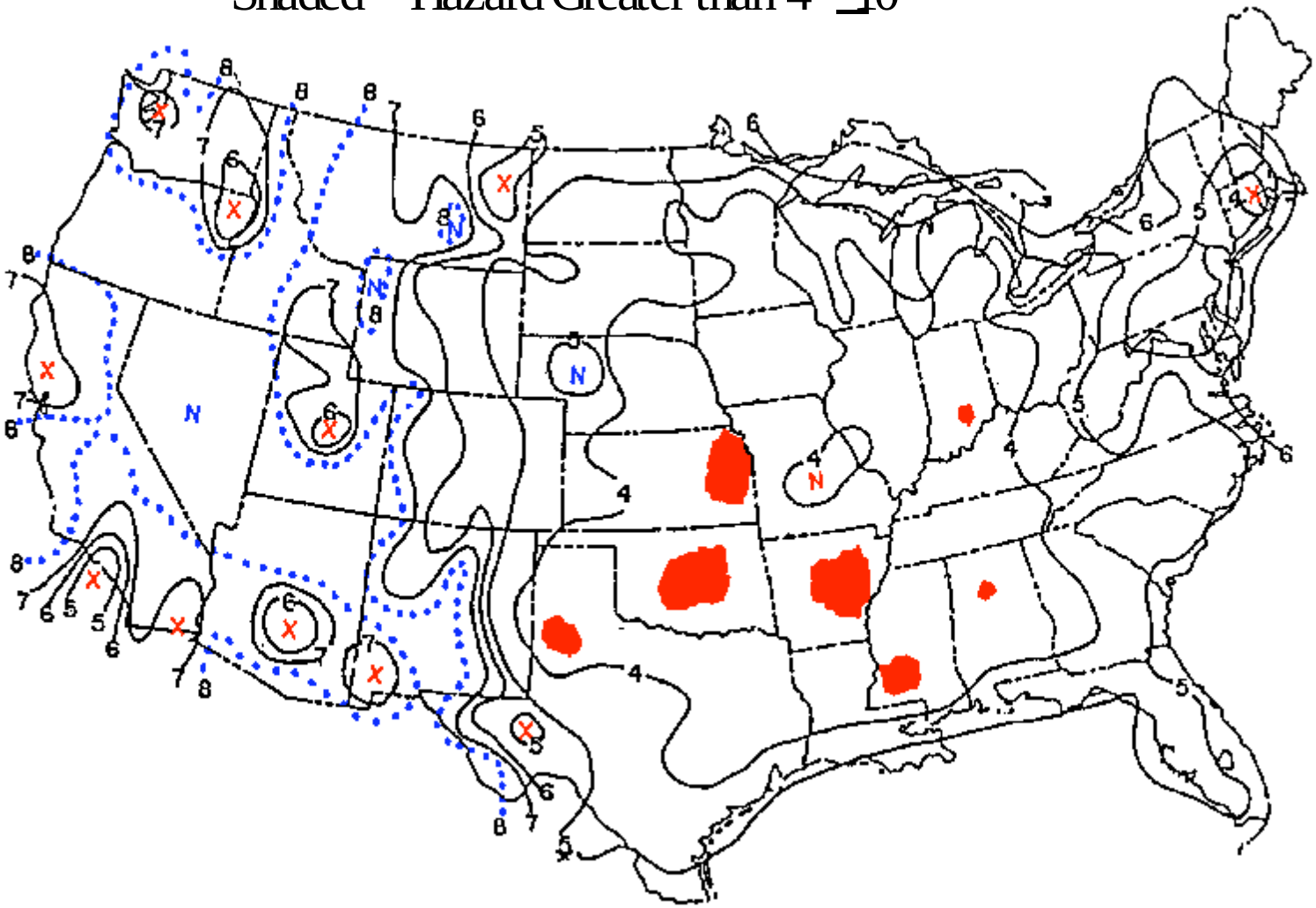
Shaded = Hazard Greater than $4 \_ 10^{-4}$



HAZARD FROM F2 & STRONGER TORNADOES

Contours negative powers of 10; X = maxima; N = minima

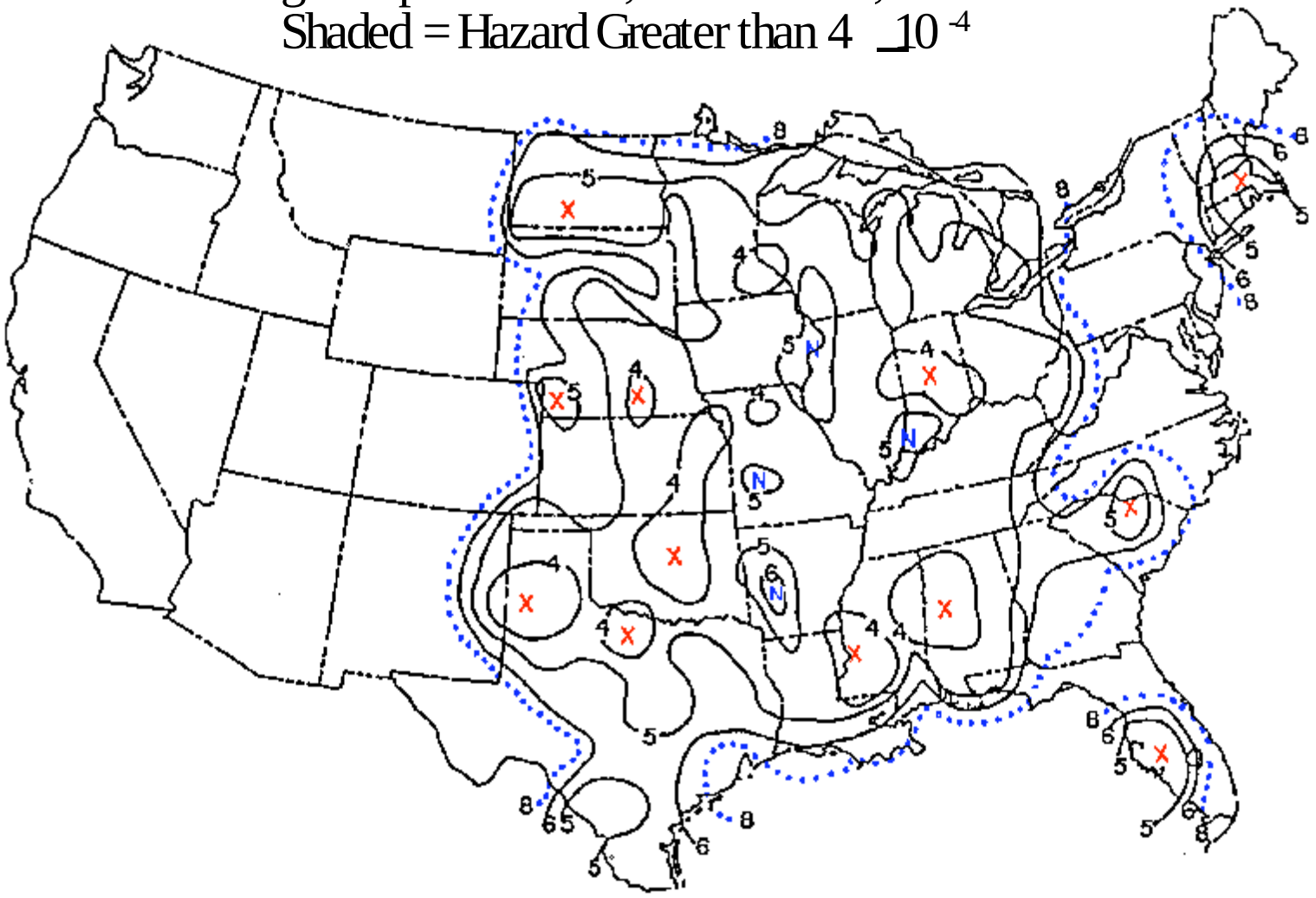
Shaded = Hazard Greater than 4 $\times 10^{-4}$



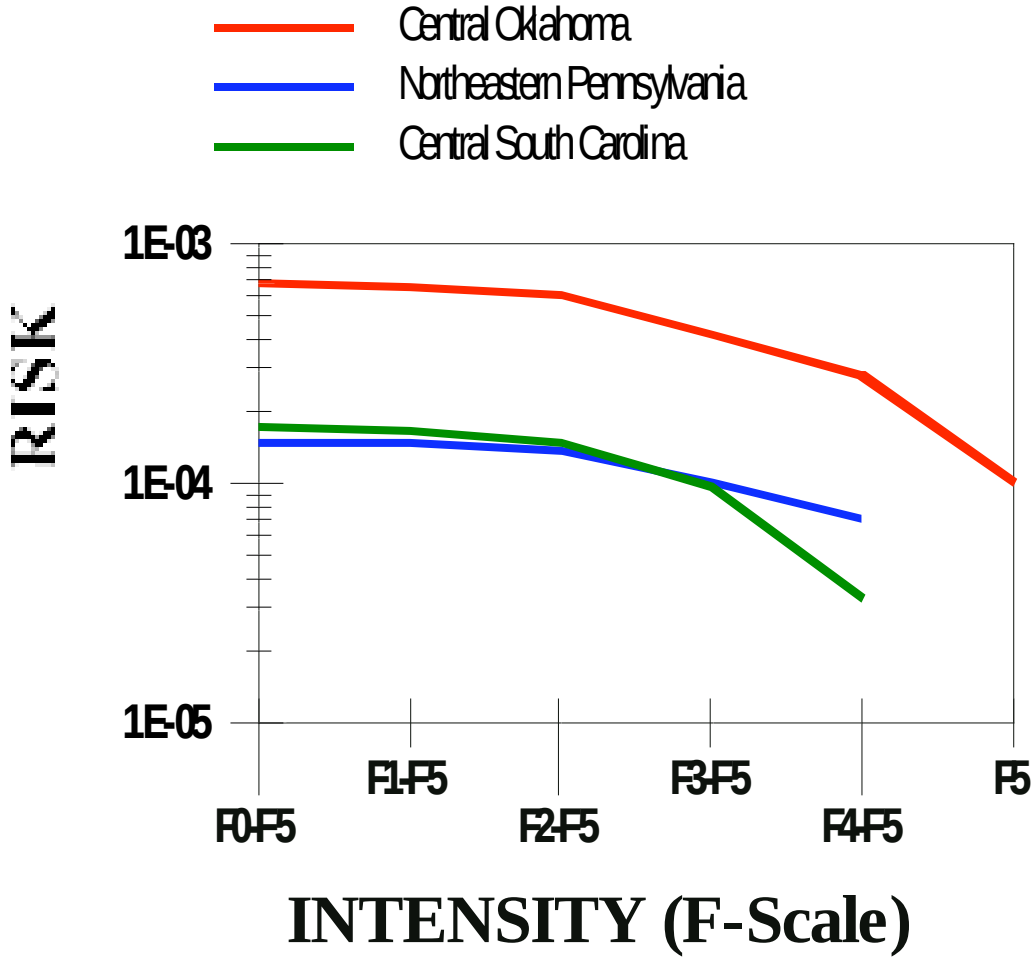
HAZARD FROM F4 & F5 TORNADOES

Contours negative powers of 10; X = maxima; N = minima

Shaded = Hazard Greater than 4 _10 $^{-4}$

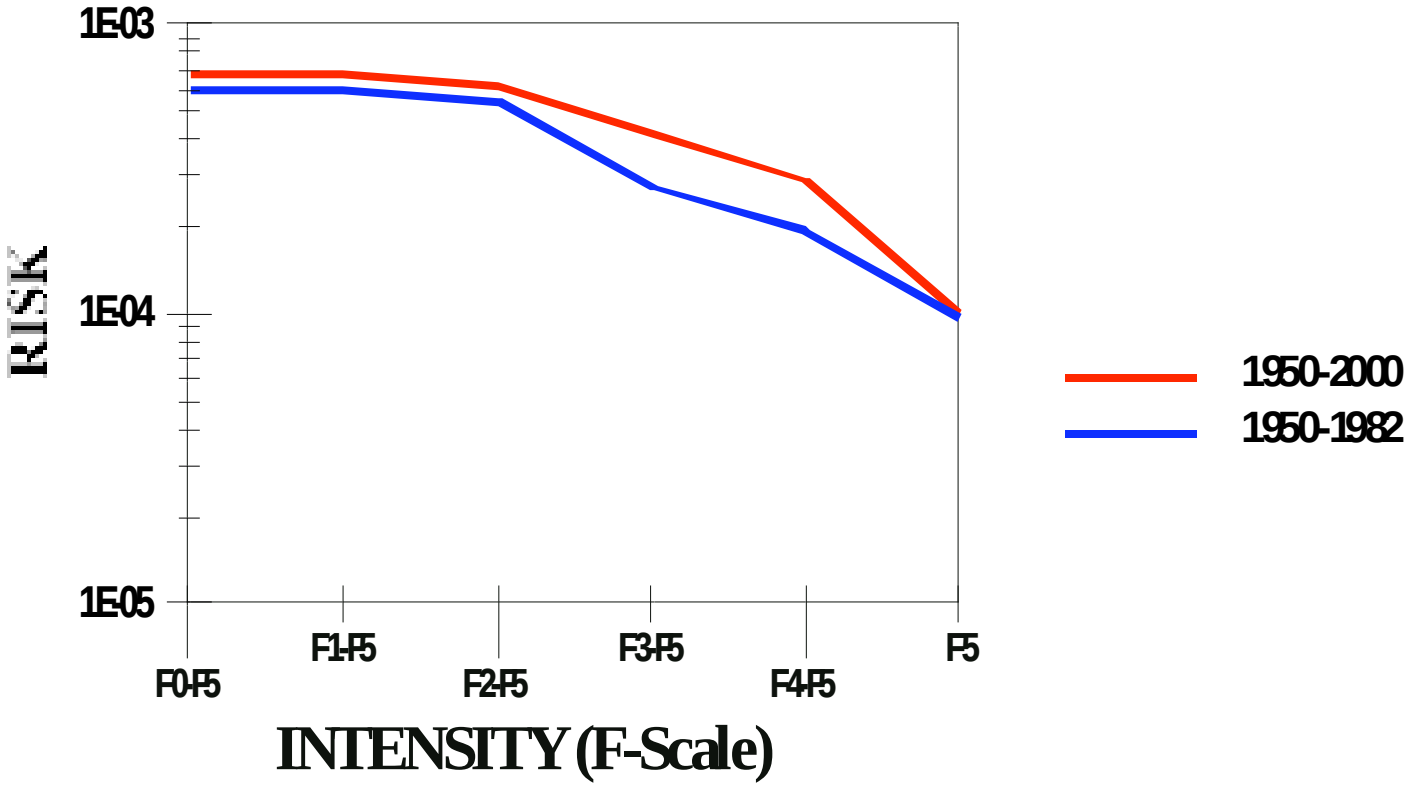


TORNADO HAZARD (1950-2000)



010924

CENTRAL OKLAHOMA TORNADO HAZARD (36N,98W)



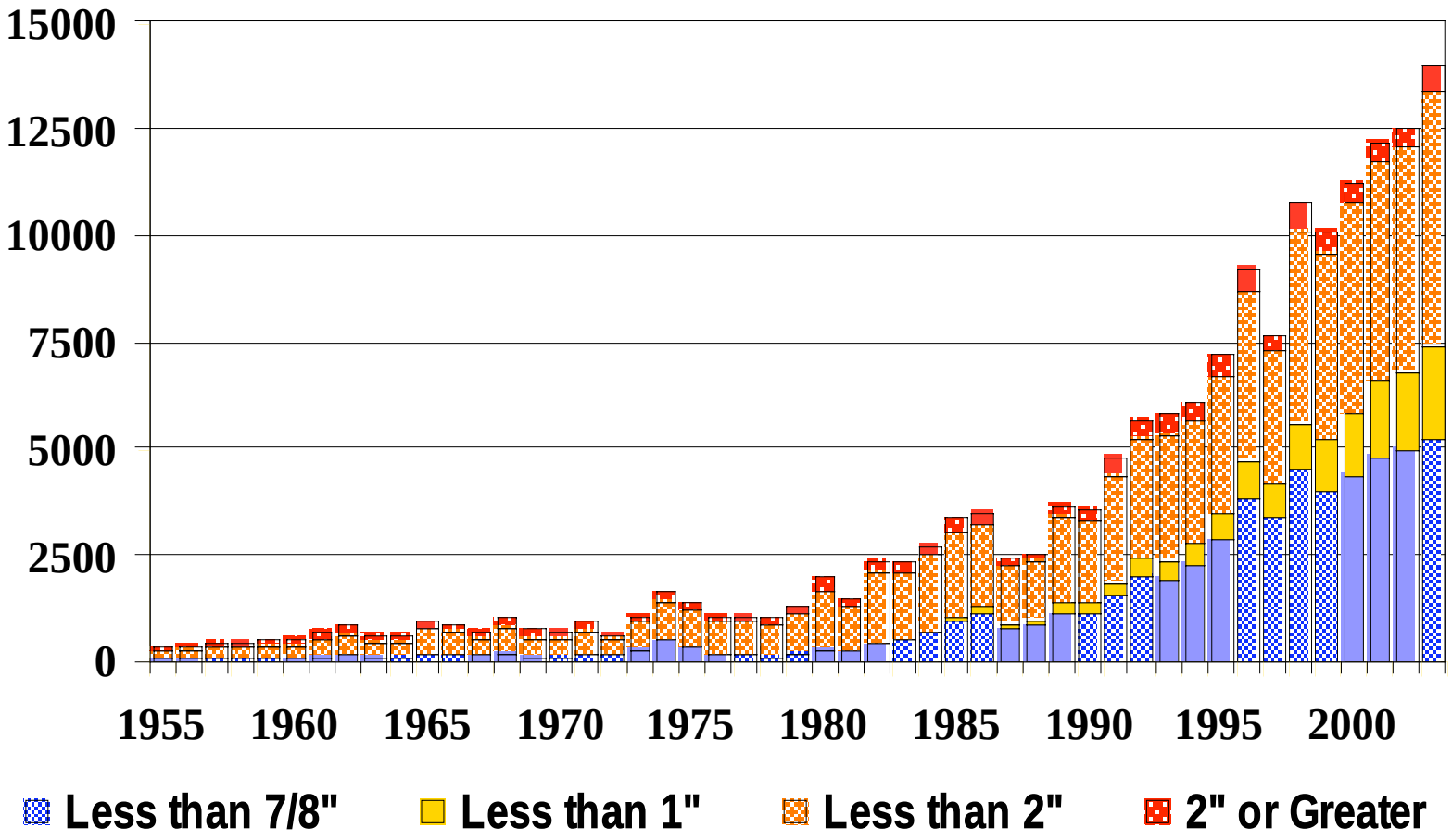
010924

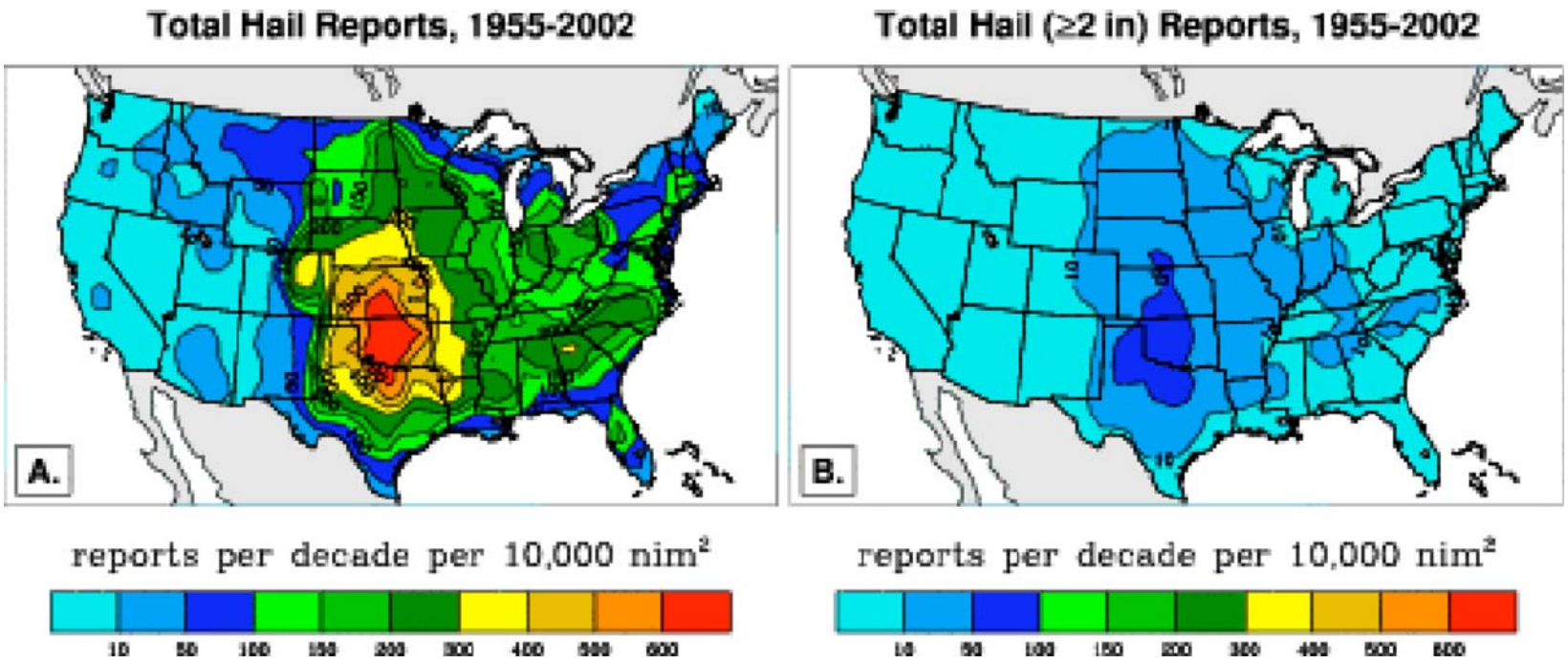
Aurora, NE
22 June 2003

Largest Stone (Estimated)
Diameter - 7.0"
Circumference -18.75"
Weight - 1.67 lb

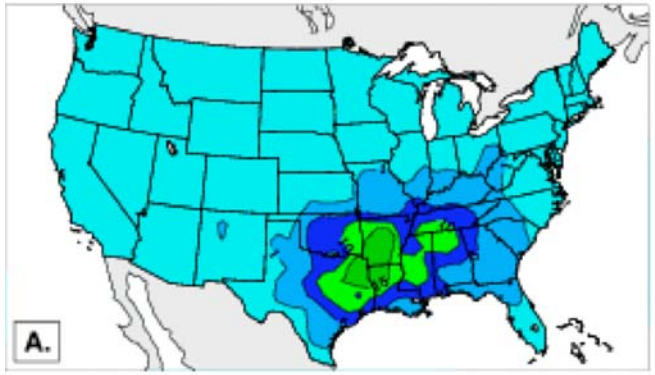
Fall Velocity ~ 120 mph

3/4" and Larger Hail Reports



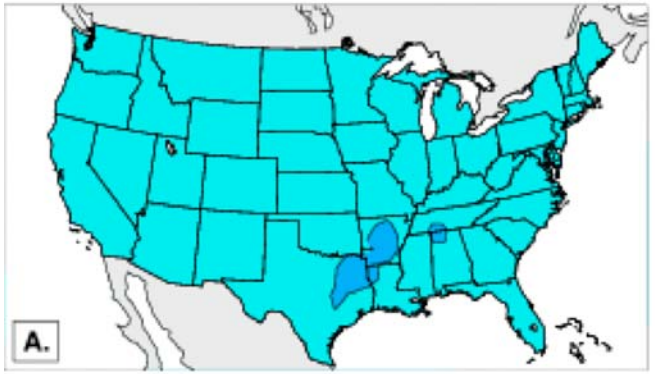

Total Hail Reports, 1955-2002
A.
reports per decade per 10,000 nim²
10 50 100 150 200 300 400 500 600
Total Hail (≥2 in) Reports, 1955-2002
B.
reports per decade per 10,000 nim²
10 50 100 150 200 300 400 500 600

January Hail Reports, 1955-2002



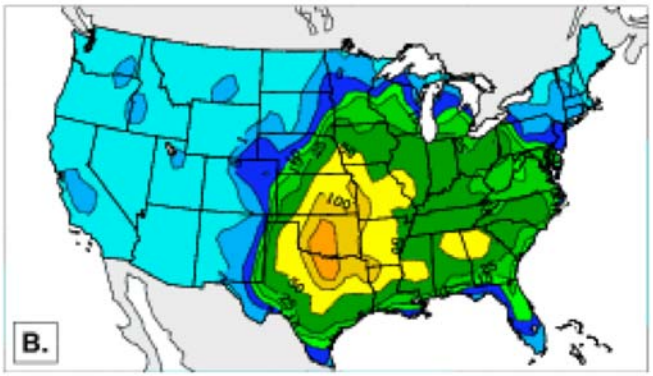
reports per decade per 10,000 nim^2

January Hail Reports (≥2 in), 1955-2002

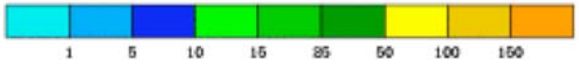


reports per decade per 10,000 nim^2

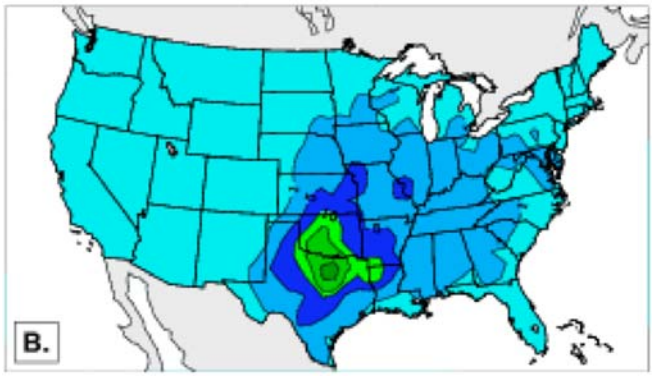
April Hail Reports, 1955-2002



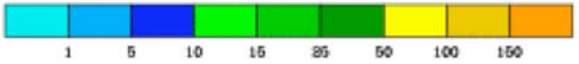
reports per decade per 10,000 nim^2



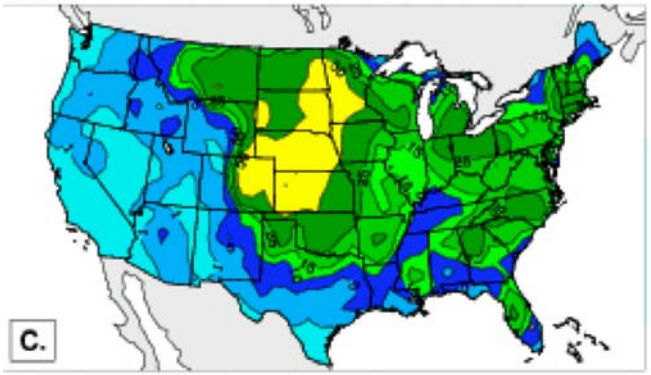
April Hail Reports (≥2 in), 1955-2002



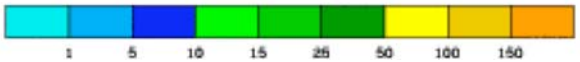
reports per decade per 10,000 nim^2



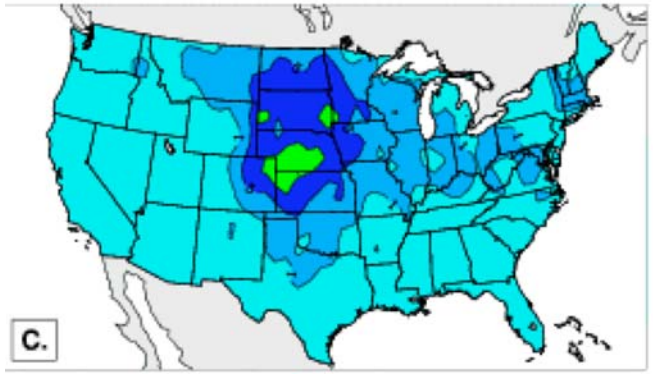
July Hail Reports, 1955-2002



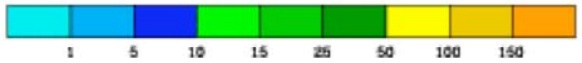
reports per decade per 10,000 nim^2



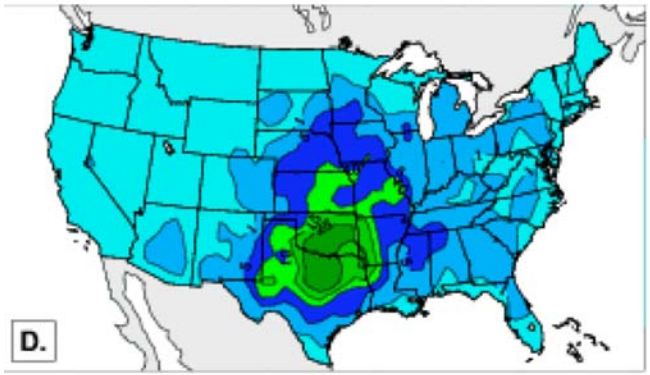
July Hail Reports (≥2 in), 1955-2002



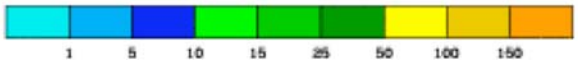
reports per decade per 10,000 nim^2



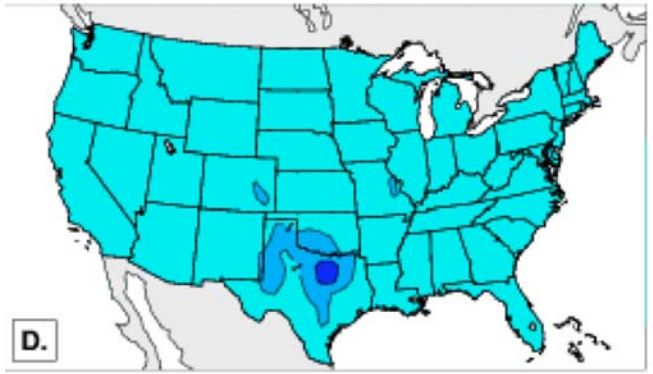
October Hail Reports, 1955-2002



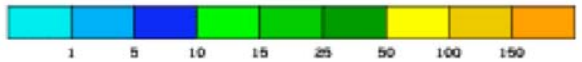
reports per decade per 10,000 nim^2

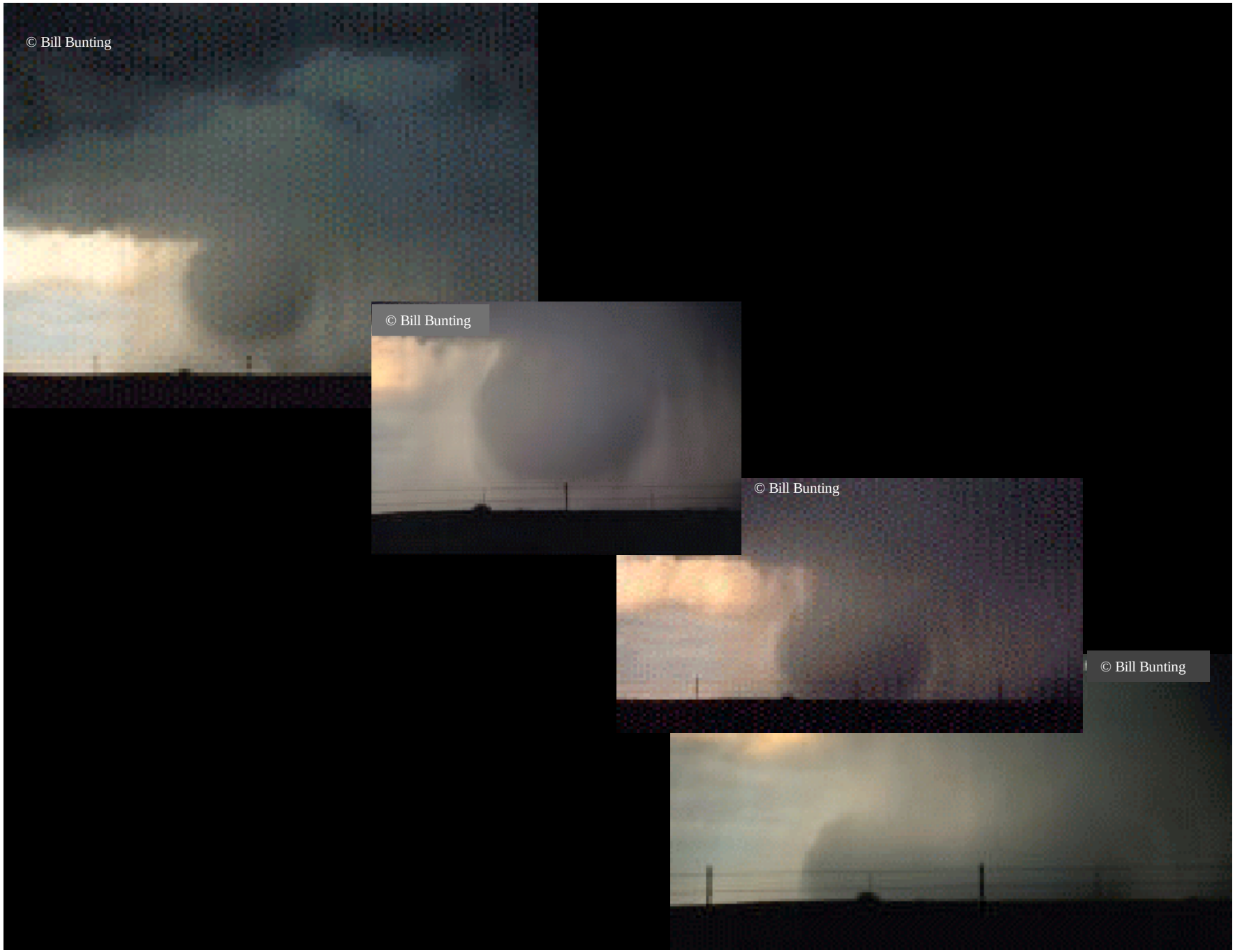


October Hail Reports (≥2 in), 1955-2002



reports per decade per 10,000 nim^2

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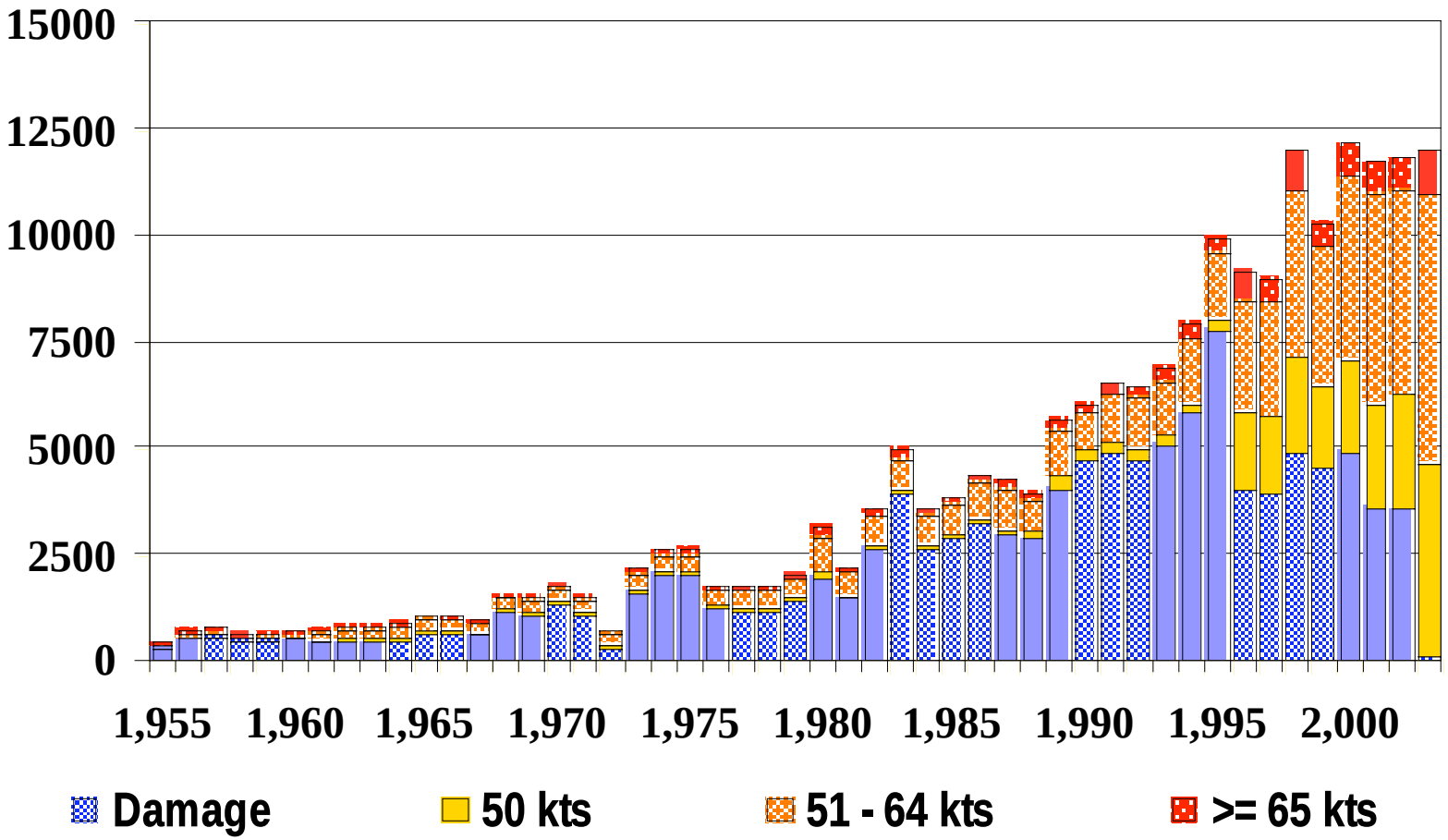
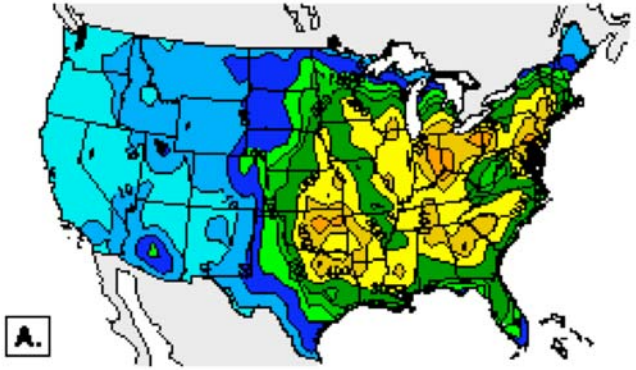
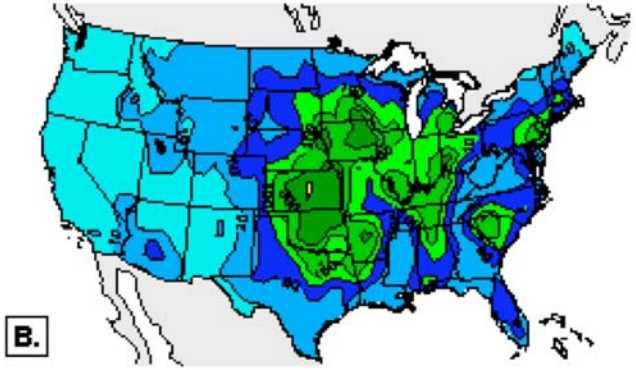
Severe Thunderstorm Wind Reports



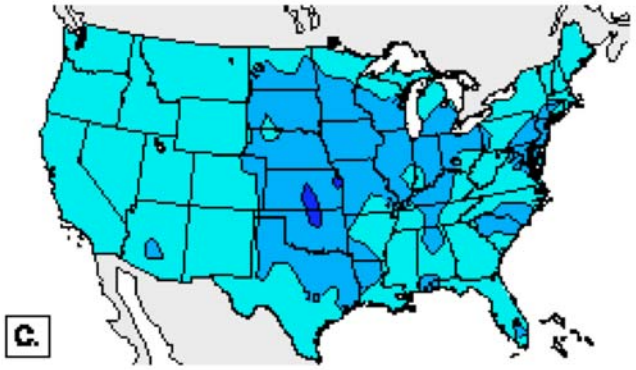
Severe Thunderstorm Wind Reports 1955-2001



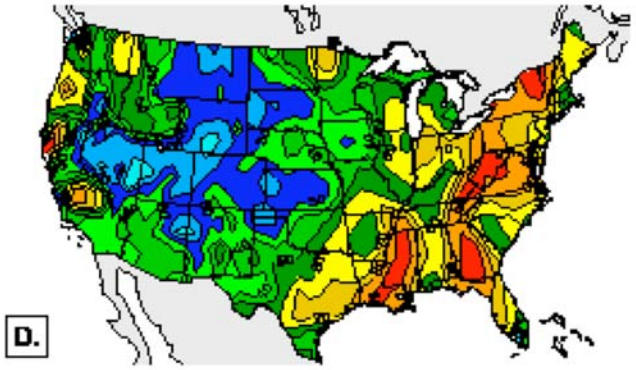
Thunderstorm Wind Gusts ≥ 58 mph

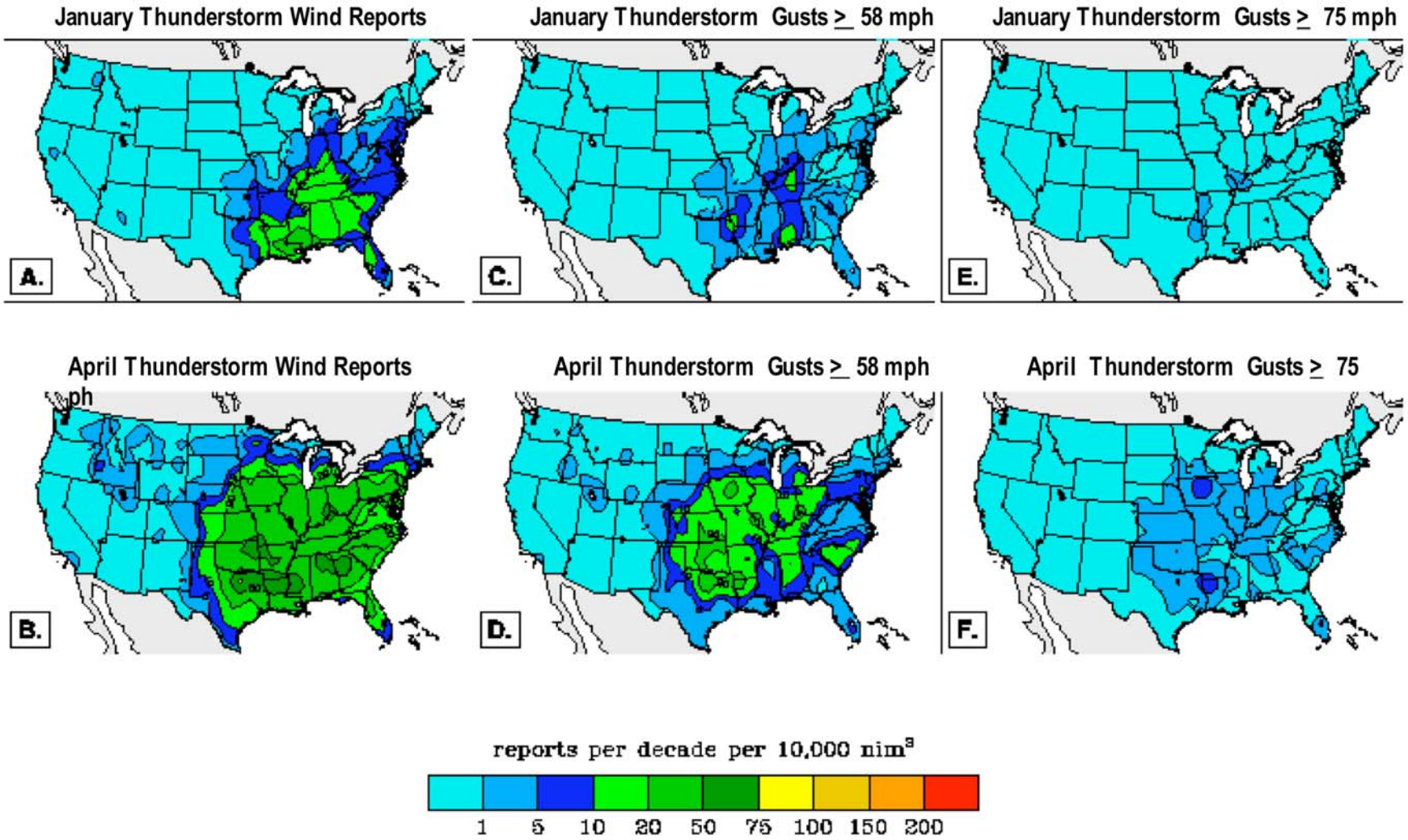


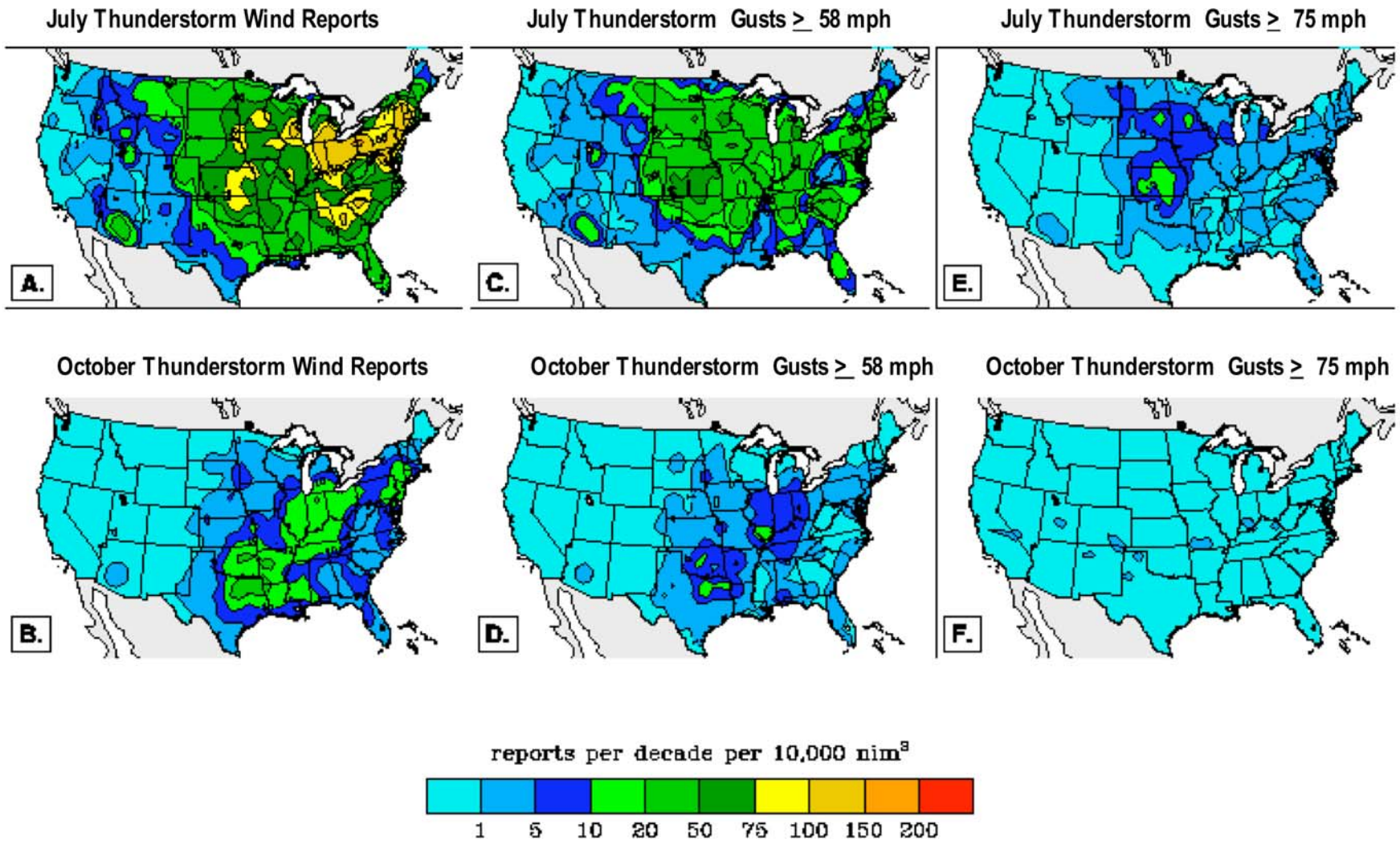
Thunderstorm Wind Gusts ≥ 75 mph



Percent of Wind Reports from Damage Only




January Thunderstorm Wind Reports
January Thunderstorm Gusts ≥ 58 mph
January Thunderstorm Gusts ≥ 75 mph
A.
C.
E.
April Thunderstorm Wind Reports
April Thunderstorm Gusts ≥ 58 mph
April Thunderstorm Gusts ≥ 75
B.
D.
F.
reports per decade per 10,000 nim²
1 5 10 20 50 75 100 150 200


July Thunderstorm Wind Reports
July Thunderstorm Gusts ≥ 58 mph
July Thunderstorm Gusts ≥ 75 mph
A.
C.
E.
October Thunderstorm Wind Reports
October Thunderstorm Gusts ≥ 58 mph
October Thunderstorm Gusts ≥ 75 mph
B.
D.
F.
reports per decade per 10,000 nim²
1 5 10 20 50 75 100 150 200

Hallam, NE – May 22, 2004, 2 ½ miles wide

"Where America's Weather and Climate Services Begin"